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THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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PUBLISHERS' STATEMENT.

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THE purpose of THE BRICKBUILDER is not to look out for the interests of any particular class of its patrons. It considers equally the interests of the manufacturer and those of the consumer. It aims, among other things, to act as an intermediary between architect and manufacturers, and in pursuance of this aim it proposes to bring to the notice of the latter the special requirements and desires of architects, as well as to acquaint architects with the various products of the manufacturers. In the matter of brick, for example, it is undeniable that manufacturers and consumers are, in certain instances, working at cross purposes, the architect desiring brick of certain color, shape, and surface which the manufacturers do not supply; they, on their part, providing certain grades of brick for which many architects have no use whatever. For the good of both parties, THE BRICKBUILDER proposes to print a selection of short articles by its various editorial writers, among whom are numbered many of the most eminent architects in this country. These articles will give the ideas of their authors as to the brick now in the market, and we are confident that their comments will be of extreme use to the brick manufacturers, as indicating the kind of material for which there is an increasing demand. The following is the first of this series of articles.

COLORED BRICKS.

THE use of colored bricks in the United States is a matter of recent introduction, but in Europe it is as old as brick construction itself, and for the reason that no method of ornamentation is at once so cheap and so effective. A wall of brick of good color and character is a fine thing, but in large masses the material is apt to be a little wearying, unless varied by patterns in color and specially shaped or arranged brick. In this country the trouble has been that builders have not been content with slight variations, but have sought for startling effects in sharp contrasts, and their success has been so great that the whole matter has fallen somewhat into disrepute. In their search for loud and vulgar effects, the manufacturers have done them good service, and the market is crowded with violently colored bricks that from an artistic standpoint are of no earthly use. The first so-called mottled brick were good, and are used in the Tiffany House in New York with admirable effect; not content with this moderate degree of variation, however, many manufacturers have exaggerated the peculiarities of mottled brick out of all reason, and, as a result, we are confronted with hundreds of structures which are horrible to look upon, so hideous is the yellow of the brick and so violent and uneasy its marking. These bricks are unmitigatedly bad, but it is unfortunate that their wretchedness should prejudice people against all kinds of mottled brick, for there are many varieties that are exceedingly beautiful, those, for example, which are used in the rear wall of the Boston Public Library. It is only necessary that a mottled brick should be low in tone, with small, unnoticeable spots, for it to be a very useful and beautiful building material.

In the plain colored bricks there is a constant increase of new shades, many of them exceedingly good. Different lots can be obtained varying very slightly in tone, and these are particularly useful for diaper work. There are varieties of a light rosy brown, rough surfaced brick made in St. Louis that can be used with fine effect, and there is another gray brick made in Detroit or its vicinity which is durable and excellent in color. These grayish and pinkish bricks are admissable, not only for exterior but interior work, and they may very possibly be the things the architects have long sought for for church interiors, where red, yellow, and mottled bricks are absolutely out of the question. For this purpose a brick of natural color and even tone is absolutely necessary, and if these gray and rose brown bricks named above could only be made in very large sizes they would prove a great boon.

For external work most of the fancy colored bricks now made are so smooth that they are objected to by many architects. Surface seems absolutely ignored by the manufacturer, and vivid color appears the object of their labors. This is unfortunate, for a brick must have a more or less uneven surface unless it is to look insignificant. The yellow "Colonial" brick recently so much in vogue would not be quite so repellent were it not that its surface is absolutely uncompromising.

There is undoubtedly a big demand for just this sort of brick, or else it would not be made, and the same is probably true, although it is hard to believe, of chocolate colored brick. If architects knew more widely, however, of some of the very delicate bricks that are obtainable, and if the manufacturers would give them good colored brick with rough surfaces, the public might be brought to see how inexpressively ugly are their cherished mottled and speckled abominations and their shiny yellow affairs. Then they might demand something better, and architects would be able to combine delicate colors in a way that would be extremely effective.

Colored brickwork is too beautiful a thing to be thrown away just because speculative builders are running riot with old gold and Colonial colored brick, and one good example of carefully combined

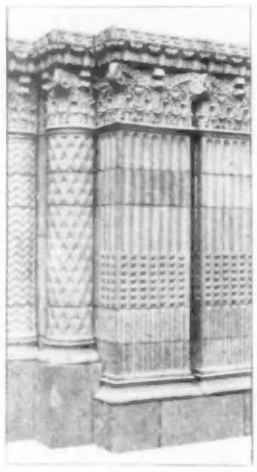
colors will do much towards stemming the tide that is now set in towards vulgarity. R. A. C.

IN the July number we shall begin Part II. of Mr. Dillon's translation of Auguste Choisy's "The Art of Building Among the Romans." Part II. will be found to be even more interesting than Part I., and contains fully as many illustrations, the larger of which will be printed on the coated paper form.

MR. WM. CONNORS, Troy, N. Y., the well-known manufacturer of "American Seal" Mortar Stains and Roofing Cement, will hold through the columns of THE BRICKBUILDER a competition for the best design for an advertisement to be used in THE BRICKBUILDER. The full program will be given in our July number.

THE preliminary work of judging the designs submitted in the City House Competition is well under way, and we shall be able to announce the winners in our July number. As there were some fifty or more designs submitted, the work will be necessarily slow. Messrs. C. H. Blackall and H. Langford Warren have consented to act as judges, and we are reasonably sure of securing the services of another eminent architect, who at the present time is out of the city.

OUR ILLUSTRATED ADVERTISEMENTS.



LAST month the advertisement of the Hydraulic Press Brick Company gave a view of the entrance to the upper church of St. Francis at Assisi. This month the entrance to the lower church is given. (See page xix.)

The church and monastery of St. Francis form the most prominent feature of the town of Assisi, which stands on the mountain-side overlooking the Valley of the Tiber.

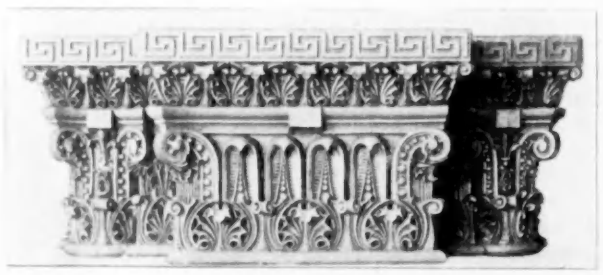
The position of the church on the side of the hill has been taken advantage of by the builders to construct an upper and a lower church, both entered on a level from public squares, which are connected by a splendid flight of steps.

The lower square, surrounded by an arcaded loggia, the entrance of the lower church, and the great bell tower are shown in this month's illustrations.

The church was built in 1228, and is one of the earliest examples of the Gothic style in Italy.

On the opposite page (xviii.) the New York Architectural Terra-Cotta Company illustrate a church of the nineteenth century, in fact, one only recently completed, of which H. F. Kilburn is the architect.

The beautifully moulded terra-cotta (examples of which we illustrate herewith) used in this church was executed by the New York Company.



COMPETITION.

WE are authorized by the New York Architectural Terra-Cotta Company to announce a competition for the best design for a full page advertisement to be used in THE BRICKBUILDER. The drawings must be made in line with black ink on sheets cut to the uniform size of 14 by 18 inches. For the best designs there is offered a first prize of $50, a second prize of $25, a third prize of $15, and a fourth prize of $10. The prizes will be awarded by a jury of three architects of acknowledged reputation. Each drawing must be marked with a motto or cipher, and a sealed envelope similarly marked containing the full name and address of the designer must accompany the drawing. These envelopes will not be opened until after the award is made. The designs for which prizes are awarded will become the property of the New York Architectural Terra-Cotta Company. THE BRICKBUILDER reserves the right to publish the successful designs. Other drawings, at the conclusion of the competition, will be returned to the competitors. Drawings must be delivered flat, express or postage prepaid, at the office of THE BRICKBUILDER not later than October 1.

TO DRAUGHTSMEN.

ANY draughtsman out of employment, who will send us his full address and answer the following questions:—

By whom were you last employed?
Can you furnish good recommendations from your last employer?
On what particular line of work have you been engaged?
What salary do you expect to receive?
Are you willing to go to another city?

may have his name placed in our Exchange Bureau, and will be notified of any parties desiring his services as a draughtsman.

All such communications will be regarded as confidential, and no charge will be made.

Address, EXCHANGE BUREAU,
THE BRICKBUILDER PUBLISHING CO.

TO ARCHITECTS.

WE call your attention to the foregoing announcement, and upon your application would be pleased to put you in communication with any draughtsman whom we think would meet your requirements. All communications will be regarded as confidential, and no charge will be made.

Address, EXCHANGE BUREAU,
THE BRICKBUILDER PUBLISHING CO.

THE most important feature in the park systems of Chicago which the city has ever considered is now in a fair way to be settled. This is the project to fill in the water front opposite the business center of the city, and make a "lake park" beyond the present shore line, which is occupied by railroads. The plan is to depress the railroad tracks, and then bridge over to an artificial park, as great in area as Jackson Park. The city will have to build a retaining wall of piles, at a cost of perhaps $150,000. The contractors on the big drainage canal are glad to have this water space for a dumping ground for a million yards or so of earth, and the city will soon be the possessor of ground valued anywhere from $3,000,000 to $15,000,000; a beautiful water front whose value to the city cannot be measured, and a site for a great museum, and, possibly, the Crerar Library, an exposition building, an armory, a great maneuver ground, and, in short, a park for the people.

THE annual exhibition of the Chicago Architectural Sketch Club, just closed, was a very successful one. Not only were the local architects well represented, but there were contributions from the East. Some of the sensible designs for school buildings made by Boston's city architect were on view, and it is to be hoped that future schoolhouses in the West will be the better for Mr. Wheelwright's influence.

BRICK AND MARBLE IN THE MIDDLE AGES.

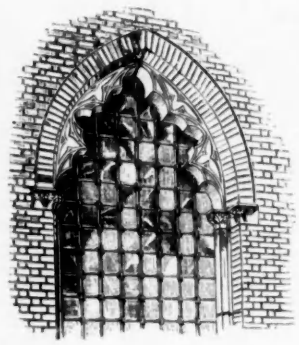
G. EDMUND STREET.

CHAPTER VIII. — *Continued.*

NEXT in order of merit to SS. Giovanni e Paolo I should place the church of Sta. Maria dell' Orto. This church is in a very bad state, and so far ruinous as to require to be supported in its interior by a forest of shores and scaffold-poles, which makes it quite impossible to get a good idea of the general effect. It has fair-pointed arcades resting upon very classic-looking columns, with capitals of poorly grouped and executed foliage. It is decidedly inferior to the two churches just described, in every respect save the treatment of its west front, which, poor as it is, sins less against all acknowledged rules than do theirs; its character is of a kind of pseudo-pointed, very flat, hard, and awkward. The cornice, with the open Italian pinnacles above it, over the central portion, is better in its effect than the singular row of niches which stands in lieu of cornice for the ends of the aisles; but it is worth while, nevertheless, to observe how simple is the design of these niches, taken separately, and how far this simplicity and the genuine beauty of their cusping and arching go towards redeeming the want of taste which is shown in the choice of their location. The doorway and rose window in the west front are of red and white marble, and in the side windows the tracery and monials are of white marble, and the jambs alternately red and white. The rest of the wall is brick, but has been plastered and washed with pink. The windows at the end of the aisles are remarkable for transoms of tracery supported upon two heights of delicate marble shafts, and entirely independent of the glazing which is fixed in frames within them. This kind of arrangement, incongruous and unsatisfactory as it is here, is worth recollecting, as being suggestive of an obvious opening for the use of traceried windows in domestic work; and it is a plan of most frequent occurrence in the best Italian ecclesiastical architecture. Many of the windows of Sta. Anastasia at Verona are constructed in this way, showing on the outside elaborately cusped and pierced plates of stone, against which, on the inside, the glazing is fixed, surrounded only with a plain circle of stone.

San Stefano is another really striking Gothic church. Its interior, notwithstanding the gaudy red damask with which the Venetians here and elsewhere delight to clothe the columns of their churches, is very fine and unlike what is common in the north of Europe. The dimensions are very large. The nave is about forty-eight feet wide, and the whole length about one hundred and seventy feet. There are a cloister and a chapter-house north of the nave, and a campanile detached at some distance to the east. The arcades of six pointed arches dividing the nave from either aisle are very light and supported on delicate marble columns, whose capitals, with square abaci and foliage of classical character, hardly look like Gothic work. The masonry and mouldings of the arches are not arranged in a succession of orders, as is the case in almost all good pointed work, but have a broad, plain soffeit, with a small and shallow moulding at the edge, finished with a dentil or billet ornament, which, originally used by the architect of St. Mark's in order to form the lines of constructional stone work within which his encrusted marbles were held, was afterwards, down to the very decline of pointed architecture, used everywhere in Venice — not only in its original position, but, as at San Stefano, in place of a label round the arch. Its effect is much like that of the English dog-tooth ornament — a succession of sharp, hard lights and shades, useful as giving value and force to a very small piece of stone work, and therefore exceedingly valuable when used as it is at St. Mark's, and equally contemptible, I am bound to say, when used, as it is in later work at Venice, simply as an ornament; for this it is not and cannot be, as it is the result of no skill or taste on the part of the workman, but just such an enrichment as might be rather better done by machine than by hand. The roof of the nave is a painted timber roof, boarded in a series of cusped lines on the under side of the constructional framework, so as to hide it. I must not forget to add that the interior of San Stefano requires to be held together by iron tires in every direction — a sin to which, in Italy, the eye soon has to become accustomed.

The whole of the exterior is very carefully executed in brick, the moulded work being well done, though very late in date and not good in effect. The western doorway is of a favorite Venetian type. It is square-headed, enriched with mouldings and carving, and above it is an arched canopy with pinnacles on each side with an ogee arched label carrying enormous crockets. The finial is a three-quarter figure, and an angel occupies the spandrel between the arch and the label. Above the door is a large circular window, unadorned with tracery or filling-in of any kind. The window from the east end of the church, of which I give an engraving, is a very characteristic example, of great width, and utterly unlike any example out of Venice.



WINDOW. SAN STEFANO.

Perhaps the very worst traceries in Venice — which is saying a good deal — are in the windows of the apse here, where the traceried arches of the head are repeated over the transom, but inverted and standing on their points. More worthy of admiration is a fine tomb corbelled out from the cloister wall to Andreas Contarina, "*MCCCLVII. Dux creatus MCCCLXXXII. In cælum sublatus*"; the arched bridge under the choir (which is carried over a canal) should also be noted, as well as the very fine campanile, which, though not boasting of any Gothic detail, is full of the spirit which made the earlier campanili so effective. But if we wish to see the best campanile in Venice, I think we must go back to the Rialto, and there, not far from the Grand Canal, we shall see in that of San Giacomo a perfectly fine example.[1] It is almost entirely of brick, and the fine long lines of its arcades give a great effect of height, whilst the details are all good and quite Gothic in their character.

The other churches in Venice are of less importance than those which I have described, but the number of remains, of which only too many are desecrated, is very large. The Accademia has attached to it the desecrated church of the convent of La Carità. This has three parallel aisles ended with apses, the usual traceries and cornices, and the unusual (I am glad to say) feature of three western gables with arched outlines [2] filled in with much small tracery in brick and terra-cotta. Another desecrated church near this, — that of San Gregorio, — is more interesting. It is of the same general design as La Carità, and, like it, is built of yellowish bricks. The window traceries are of white marble. The most interesting feature here is the cloister, entered by a remarkable doorway from the Grand Canal. The doorway is square-headed, with an ogee trefoiled archway or window on either side, and a sitting figure of a bishop under a slight canopy over the doorway. The cloister has five bays on each side, divided by columns which rest on a marble and brick base, and carry a wooden framework enriched with very good mouldings.

Another desecrated church is that "dei Servi," which has a fine lofty brick front with a large rose window.

In the Campo Sta. Zaccaria is a portal much like that of San

[1] I refer here to San Giacomo del Rialto. Its neighbor, San Giacomo del Olio, has also a brick campanile, but of inferior merit.

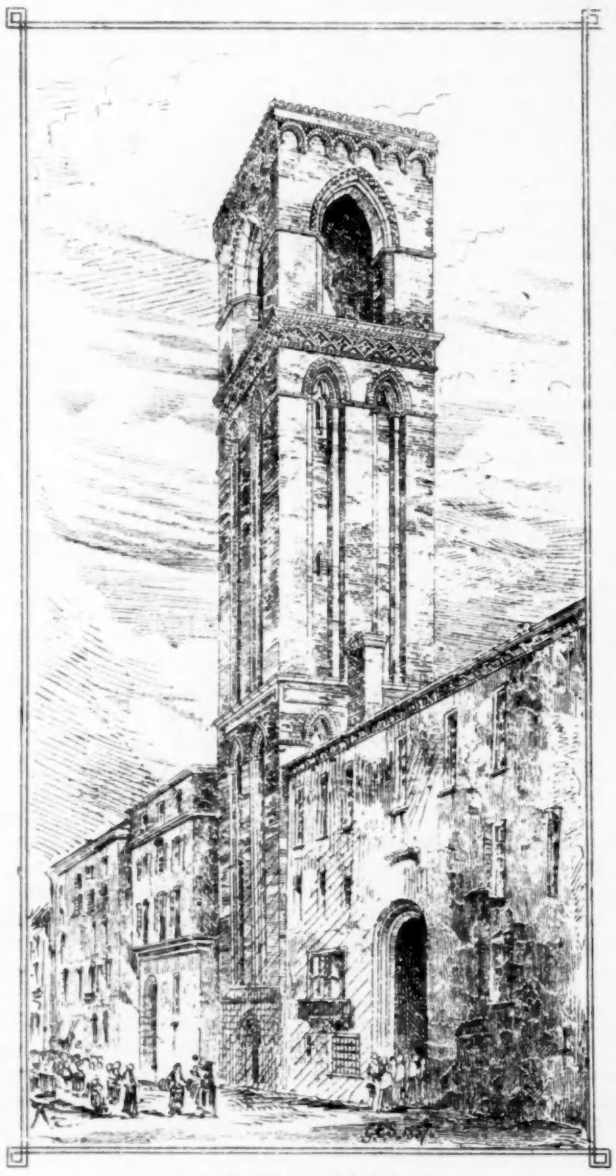
[2] A view in the *Nuremberg Chronicle* shows these three gables just as they now are.

Stefano, save that it has in the tympanum a good figure of the Blessed Virgin with our Lord, with a saint on each side — the two Saint Johns, I think. The Virgin is seated on a Gothic throne, carved in very low relief, and the whole composition is decidedly fine; comparing it with the doorway at Mazzorbo, I should say this must be a work of A. D. 1380. The church of Sta. Zaccaria is an early Renaissance building, with many of its arches pointed. It has an aisle and chapels round the choir, an unusual plan in Venice, but otherwise it has no interest.

The church of l'Abbazia has some fair detail in its cornices, with pinnacles at its west end of the same type as those in the Madonna dell' Orto, and has poor ogee-headed pointed windows; near it is another of the canopied doorways, — the gate of the Corte Vecchia, — with an outer arched canopy, within which, under an ogee-shaped label, stands the Blessed Virgin with our Lord in an aureole on her breast. Two saints stand at her side, and groups of little figures kneel at her feet, whilst from the upper finial our Lord gives His blessing. This bears the date of 1505.

I think I have now said enough about these late Gothic churches. I have never been able to interest myself much about them. The work of which they are specimens is so exceedingly poor, cold, and distasteful to me that I feel much inclined when I attempt to sketch them to give up ecclesiology in despair. The truth is that, St. Mark's excepted — and of course it is a very wonderful exception — the churches of Venice do not come up to the expectations of any one who has ever experienced the delight of visiting the churches of much smaller cities in France, Germany, and England. True, indeed, there are much interest and a great breadth and dignity about the general effect of such a church as the Frari; but for all those lovely points of detail which in every direction amaze us by the art they display and the rich array of beauty with which they clothe the walls of northern cathedrals, here is there no kind of equivalent.

When I had thoroughly come to this conclusion, and settled in my own mind by repeated inspection that my judgment was not harsh or unfair, I confess I felt a weight off my mind. I was now free to indulge myself to the full in the search for what Venice really has in greater abundance, perhaps, than any other city in Christendom, — remains, namely, of mediæval domestic work. Nothing can be conceived more delightful than such a search. You seldom go a hundred yards — often it is much less — without coming upon some remains, or, perhaps, some nearly perfect example, of an old Venetian palace; and then, with the gondola fastened to one of the great posts which line all the canals, the well-satisfied gondolier lying stretched on his back behind the awning, your friends laughing and talking within its dark recess, you sit most luxuriously, and make your notes and sketches with a degree of quiet comfort which is not a little conducive to accurate and careful sketching and to diligence in its pursuit.



SAN GIACOMO DEL RIALTO.

Venetian palaces divide themselves naturally into two great classes, — the Byzantine and the Gothic; and it surprised me very much to find remains so perfect and so extensive of the former class even on the banks of the Grand Canal itself, where change has been ever so frequent and so rife. Indeed, it is singular that nearly all the Byzantine palaces are situated on its banks.

Of these palaces, certainly the most striking by far are the Ca' Loredan, the Ca' Farsetti, and the Fon daco de' Turchi. They all agree singularly in the general idea of their design, and consist of a grand scheme of arcading over the entire front. Divided, generally, into two stories in height, they are again divided in a marked manner in width into a center and wings. This division is effected solely by a great difference in the spans of the arches forming the arcades, which in the wings are much narrower than in the central division. In the upper arcade the spaces between the columns, and, indeed, the whole arrangement, are often studiously unlike those in the lower range; but, at the same time, there is so very much similarity in the detail of the whole that this variety, far from being perceived as an irregularity or a fault, does in truth just suffice to give force and vitality to what might otherwise appear to be monotonous and too often repeated, and recalls to mind not a little the very similar kind of difference between the upper and lower order of shafts already described in the west front of St. Mark's.

(*To be continued.*)

AMERICAN ENAMELED BRICK.

THE almost universal use of enameled brick for the inner court construction of the modern office building shows a desire on the part of the owners to give all possible light and cleanliness to their court tenants. This is not a philanthropic move on the part of the owner, — there is money in it. The advantages of a court so lined are made manifest by the great demand for inside offices in buildings, whose white court walls make every inside office, from the highest to the lowest, light and desirable. Until recently we were obliged to depend upon foreign manufacturers for these brick. Now, however, enameled brick of all desirable colors, shapes, and unsurpassed quality are manufactured in our midst.

There are nearly a dozen plants scattered through the land where enameled brick are being manufactured with more or less success. The West has probably made more headway in this respect than the East, and many of the sky-scrapers in this city and elsewhere have their courts lined with enameled brick of American manufacture. Although not all the enameled brick made in this country are a success, nevertheless it is gratifying to know that in this industry we are cutting loose from Europe, and it is the determination of the American manufacturers to persistently apply themselves in this regard until perfection is reached.—*Exchange.*

ARCHITECTURAL TERRA-COTTA.

BY THOMAS CUSACK.

N yielding to a request of the enterprising publishers of THE BRICKBUILDER, to discuss the salient features of Architectural Terra-cotta, the logic of the situation requires that we start at the beginning of that subject. This takes us back over a period of nearly four thousand years, though the earliest attempt to utilize clay may be antediluvian, and is probably coeval with the first appearance of man on this planet. Rude vessels of baked clay rank among the infantile efforts of the human race. They were suggested by man's first necessity, then as now the prolific mother of all his inventions. The works of the primitive potter are as old as that of the grave-digger, and, like the houses that he builds, they, too, last until doomsday. The existing relics themselves show that clay has been resorted to by every known, and some otherwise unknown races of mankind, ever since the grandsons of Noah said one to another, "Let us make brick, and burn them thoroughly." It will be seen that the advisability of *burning them thoroughly* was recognized at a very early date, and if the translators of Genesis had been practical men, as well as scholars, they would have italicized that most essential part of the specification. This the present writer has, with all deference, and at this late day, taken the liberty of doing on their behalf.

These people were, in this respect, at least, wise in their generation, and if they failed in their desire to establish a short road to heaven the intention was good and commendable, and the attempt quite as feasible as that made by some of their descendants. At any rate, they *did* succeed in erecting the first and most notable of all "skyscrapers." Bountiful nature had already placed the material at their feet, and as one may infer, pretty well soaked by the waters of the deluge. As the prehistoric clayworker became more expert in its use, it soon began to fall into shape, "like clay in the hands of the potter," thus furnishing a simile for dexterous manipulation that has done duty throughout all intervening ages.

BABYLONIAN BRICK 14"×14"×4".

The potter's wheel used by the Egyptians, so simple, yet so perfect for its purpose, has survived the revolutions which time and change have wrought in all other mechanical arts, and it remains today the same in all material particulars. Indeed, it has been aptly remarked that, should a "thrower" start into life from among the mummies, a temporary confusion of tongues, ancient and modern, would be about the only drawback to his receiving remunerative employment in Staffordshire or Trenton.

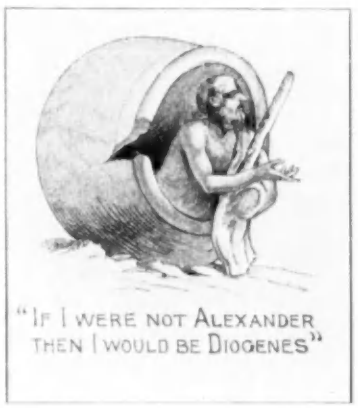
The facility with which clay could be fashioned into shape led to its being used for an endless variety of purposes. The funeral urns, statuettes, inscribed tablets, and, above all, the polygonal cylinders of the Assyrians, with cuniform characters made readable by Rawlinson and Layard, are the most tangible landmarks which we have of those ancient times and peoples. They supply not the missing, but the connecting link between ourselves and a very remote ancestry. These forerunners of the fictile art range all the way from votive offerings and emblems of worship, of war, and of triumph to bacchanalian cups and the humbler but more necessary ones of domestic use. The priceless specimens of archaic pottery and terra-cottas to be seen in the British Museum, as in that at South Kensington and the Paris Louvre, etc., proclaim their own indisputable version of ancient history. To come nearer home, the growing collections with which we recently refreshed our memory in the Metropolitan Museum of Art have a peculiar fascination for every thinking person whose mental retrospect is not abridged by the things of yesterday. It is therefore to the museums that we go, enriched as they have been by recent discoveries, rather than to the libraries, when in quest of indubitable facts and the earliest of all data concerning mundane affairs. It was on tablets of soft clay that the state papers, public records, and commercial transactions of the Assyrians were written, and rendered indelible by firing. A portion of what may have been the circulating library of Nebuchadnezzar is now on the shelves of the British Museum, in the form of brick tablets as perfect as when first made, and, though but few, even among scholars, are able to decipher them in the vernacular, as George Smith was in the act of doing when he died at Koyunjik, yet these same leaves of ancient history are legible to all of us in a still wider sense. The inscriptions are said to confirm the writings of Herodotus and to correspond with the Biblical account of the deluge and of the destruction of Jerusalem, when "the Assyrian came down like a wolf on the fold." One thing we do know; these, in common with similar antique relics of a buried past, bear the manual impress of their makers, and irresistibly call to mind the existence of men and of races long since extinct, taking our thoughts back through the ages, until lost in infinity. Yes, there they are to-day; having withstood the inexorable tests of time and of climatic change for periods varying from two to four thousand years! Mute, but

PELEUS AND THETIS. BRIT. MUSEUM.

AZTEC IN HIS FUNERAL OUTFIT.

none the less unanswerable witnesses these to the practical indestructibility of burned clay.

The aborigines of this country, unlike the composite race that has succeeded them (Figaro says "Britonized Indians"), were a little behind their brethren of the East in the esthetic use of clay. The Mound-Builders, however, cooked their food and carried their water in native pottery, made from the same material as they had used "to stop the holes to keep the wind away." The Aztec and Peruvian potters, if we may judge of them by such portions of their work as have survived, were at least fertile in the creation of forms at once curious and grotesque. Failing as artists, according to Grecian or Etruscan standards, they seem to have taken their revenge as caricaturists, all unconscious that in this they were setting an example that would be observed by their successors long centuries after them. The Petiche collection (Metn. Museum) contains two whistles, each about eight inches long, made in terra-cotta, and in the same case may be seen the Mexican idea of model and mould making. Two Aztec tiles about 2'0" x 2'0" x 3" with a dragon ornament in relief, of most forbidding aspect, may have been part of a frieze to some of those wonderful stone structures of which Prescot and Stephens have written, and which were forest-covered ruins, unknown to the natives themselves, long before the arrival of Cortez. The calumet was made of burnt clay, however little it may have been used as a "pipe of peace." And when these fierce tribesmen got ready to return to mother earth they had jars made of burnt clay, with close-fitting lids, large enough for their interment with sufficient room left for some of their worldly goods and chattels, which, contrary to a seemingly mistaken dictum of our own time, they *did* manage to take along with them. The Greeks also produced urns of liberal dimensions, for it will be remembered that it was in an earthenware tub that Diogenes made his domicile and received visitors, one of them being no less a person than Alexander himself.

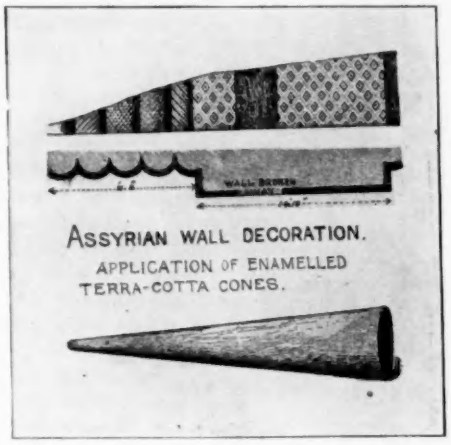


"IF I WERE NOT ALEXANDER THEN I WOULD BE DIOGENES"

The sun-dried bricks used in the thick walls of Babylon became comparatively hard in that dry Eastern climate, and were cemented together with bitumen. Burned and vitrified bricks were used in the more important structures where space became a consideration. These were laid in what seems to have been lime mortar, so adhesive that travelers and explorers agree in speaking of the difficulty experienced in separating one block from another. Moulded forms alternating with plain surfaces show that the Babylonian builders were not insensible to the value of light and shade. Not satisfied with monochrome, however, they devised a method of applying color. Terra-cotta cones were made and enameled in brilliant colors on the base, which was about three and a half inches in diameter. These cones were inserted in the unburnt clay during progress of building, giving an inexhaustible variety of diaper and zigzag patterns, recalling the lozenge and chefron of a Norman doorway. We have here the earliest known instance of ceramic art, as applied to wall decoration. The revival of architectural color enamels in England and the more recent attempts to introduce them in America will receive due attention under the head of faience in a succeeding chapter.

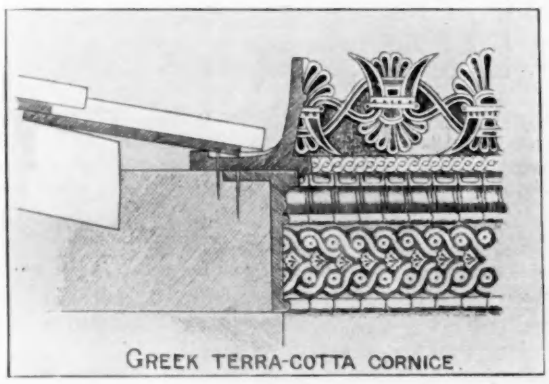
The Greeks, notwithstanding the abundance of their building stones, and the consequent monolithic character of their architecture, resorted to terra-cotta for reliefs and sculptured ornament. They used it for friezes and for the pierced lotus leaf enrichment of their cornices, in a way that actually seems to have suggested its application in some recent instances that we could mention in modern practice.

The Romans introduced the art of brick making into the British Isles more than two thousand years ago, traces of which still exist in the Abbey Church of St. Albans, and many interesting remains are treasured up in the British Museum. An ancient furnace and some Roman tiles were dug up a few years ago in Staffordshire. Here is the center of modern English pottery; though the art seems to have dwindled and disappeared during the dark ages, yet to-day, as a learned writer has pointed out, "the potter's wheel revolves over the potter's grave." This is no mere coincident. The clays that are used there now for the commoner classes of goods are from the same beds that attracted the more industriously inclined followers of Julius Cæsar, soon after that enterprising gentleman said, "*Veni, vidi, vici.*"



ASSYRIAN WALL DECORATION.
APPLICATION OF ENAMELLED TERRA-COTTA CONES.

The Romans continued the use of terra-cotta for friezes and enrichments, even to the extent of Corinthian capitals, and applied it to a much greater variety of purposes than the Greeks had done. Of the Roman arch, to those who have the advantage of Mr. Dillon's translation, and the not less admirable reproductions of Choisy's plates, in current issues of THE BRICKBUILDER, nothing farther need be said. If they did not invent it, they certainly made most extensive and excellent use of it, and have left behind them enduring examples of its varied construction. It was in itself the outcome of a desire to use blocks of smaller section in the spanning of openings than the stone lintels employed by the Greeks, and in which they were restricted to the length and carrying capacity of the stones. The arch enabled them to span much wider openings, without any stones whatever, and by adopting suitable ground plans to enclose areas of enormous extent, which the Greeks would have had to leave



GREEK TERRA-COTTA CORNICE

uncovered. With the general introduction of this system of building, it became largely a question of brick production, and with the increased demand for brick of all kinds that had been thoroughly burned, the whole process of their manufacture improved, until it reached a higher degree of perfection than had ever before been attained. A style of brick commonly used by the Romans has been

revived in the long, thin, "Pompeian" brick now so popular in the New World. And in it, when we want to credit a man with the highest qualities of sturdiness and integrity, we compress the whole vocabulary of eulogium into the simple and direct saying, "*He's a brick.*"

The celebrated hyperbole of Augustus, that he had "found Rome of brick and had left it of marble," was a doubtful boast, even if it had been true. At best, it was in most cases but a veneer, and often enough a *stucco imitation* of a veneer. This saying, no doubt, served its purpose as a figure of speech, but, like many other flowers of rhetoric, not confined to the country or age of Cicero, neither it *nor* the marble has stood the test so well as the bricks have. The arch of Augustus was erected at Rimini, to commemorate his reign, and incidentally to recognize his restoration of the Flaminian Way. The triumphal car and statue of himself placed on top mouldered away, and had been replaced, sometime during the Middle Ages, by a parapet built of the despised brick! A recent photograph shows that, while the stone entablature has crumbled, and the volutes have dropped off all the capitals, and the attached columns show signs of ultimate annihilation, the embattled parapet of brick, though the most exposed part of the structure, stands weather-beaten and hoary with age, but every brick in perfect condition. A fitting memorial this, surely, to the Roman brickmakers, at the expense of a Roman emperor. It but needs a little pointing up of the joints by a friendly hand that would not disturb the tufts of grass with which this remarkable monument has by nature been made venerable.

The Pantheon has withstood the vicissitudes of time better than any similar building of equal antiquity. It was there before the wise men from the East came to Jerusalem saying, "Where is he that is born King of the Jews," and it is there yet, despite the rapacity of successive rulers and the irreverent hands of the despoiler. Its walls are of brick, backed up with concrete, covered and indeed strengthened by a dome of the same material. For a third of their height they were at one time cased on the outside with the choicest marble from Greece, the other two thirds being covered with a stucco composed of pulverized marble, said to have been as durable as the marble itself. Around the eaves ran a modillion cornice and another of less projection in line with the original pediment. These were perhaps in marble, but more probably in travertine stone. This outward finish must have appeared very beautiful about nineteen hundred years ago, but where is it now? Why, dissolved into its original elements, carbonate of lime. The fine brickwork of the composite walls of the rotunda, with relieving arches, presumably to span the great niches of the interior, is no longer hidden from view by the sham finish of which Augustus should have been ashamed. They stand up to-day, sound and secure, after a lapse of two thousand years, in their uncompromising grandeur, as if in resentment of the slight which, by implication, Cæsar Octavianus and his friend Agrippa had put upon so serviceable a material.

It is often our privilege, and always a pleasure, to offer suggestions to architects on special methods of terra-cotta construction, but we were born too late to be of any service to Augustus. This we regard as matter for regret. That casing and cornicing should have been done in light gray terra-cotta, *thoroughly burned*, and vitrified on exposed surfaces. The combination would have been honest, the appearance beautiful, and the result imperishable. The enormous advantage — unique, though too often lost sight of — its open chambers at the back, would have enabled the brickwork and concrete to be incorporated into the cells of every block and grouted full with pozzoland, in a way that is impossible with stone or marble. Had this been done with the same skill and thoroughness displayed in the construction of the dome, who will say that the terra-cotta would not have been there to-day, disputing the honors, in point of durability, with the bronze doors, and threatening to outlast the granite columns of the restored portico.

(*To be continued.*)

SEE program for another competition announced on page 116.

SURFACE AND COLOR TREATMENT OF TERRA-COTTA.

PAPER READ BEFORE THE CHICAGO ARCHITECTURAL CLUB BY MR. WM. D. GATES.

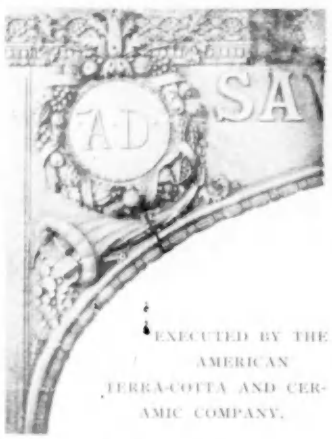
EXECUTED IN TERRA-COTTA BY THE AMERICAN TERRA-COTTA AND CERAMIC COMPANY.

ON a recent trip, I regaled myself one evening at a barnstorming event in a southern city, and it chanced that I journeyed the next day in the immediate company of the band of actors I had seen the evening before. All through the long, hot, and dusty ride, as I sat over a flat wheel turning on a rough track, I was, in the absence of any other occupation, compelled to study my fellow passengers for relief. I viewed the very evident fat coarseness of the hero of the night before. I noted the haughty queen, now shorn of her tinsel and hauteur and on a common level, dickering with the train boy for an apple. (What a pity Mother Eve had not bargained thus and thereby saved us.) But especially as I sat in the seat immediately behind the fair-haired heroine, and saw that her very abundant golden hair had evidently gone in the trunk with the other regalia, and saw that no sane man would be at all justified in undergoing hardship and danger in her behalf, and, finally, as she wearily turned her head and I noted a total absence of the flashing eye and blooming cheek that had thrilled the hero the evening before, as I noted the flabby skin with strong promise of a struggling beard, I was forcibly reminded of the subject of my recently promised paper before you, gentlemen, "Surface and Color Treatment." So I pulled myself together, looked away from the heroine, and looked out of the window. Out across the bay I looked over an expanse of water fringed on the opposite side with pines. The white sails of two schooners cut sharply against the piny horizon, while the water of the bay glistened in the sunshine and rolled under a fair sailing breeze.

I said to myself, the foreground of that picture is formed wholly of waves and the waves are all alike. Then, looking more carefully, I said, no, not alike. They are similar; one has a speck of foam, another none. One is arched here, another depressed there. They are very much of a kind, but are all different. One only has to think of an artist attempting to paint waves with a rubber stamp to realize what such repetition would effect. Then my eye rested on the fringe of trees and I said, all are alike, one pine and a thousand pines. Then second thought said, not so; one is big, another little; one bends this way, another that. Into each detail of leaf and bark, of branch and root you may trace similitude, but not duplication. A difference everywhere, and yet a harmony all pervading. So with the sails, they have their differences, and even those black specks against the sails which we know to be men, and you know how they differ.

So I am led to conclude that Nature does not duplicate. That she uses harmony, but likes endless variety, and that all these little differences fit in and make a complete and harmonious whole. In the surfaces that Nature gives us to study, the treatment indicates individuality and endless diversity, but no departure from harmony. This will warrant much study on our part, particularly those of us who are using material capable of being readily changed.

Let us look a moment at what has been the history of surface treatment in architecture. At a very early period, rough, loose boulders were undoubtedly used piled up into a very rude wall, very likely in the first instances to close the entrance to some cave, and most likely laid up entirely without reference to appearance. But taste would not be long in showing itself, and soon some one would begin to acquire a reputation as being specially handy at this work, and he would begin to place the best-looking surface outward, so that there would be noticeable improvement, and, finally, rivalry between different artists in this line would lead to the inevitable result of crude tools, shaping into more convenient form, and then to the further extent of dressing the surface of the stone and bringing it into more perfect condition for the purpose required. So rectangular forms would succeed roughly rounded ones, and tooled surfaces would succeed the gravel and water worn work of the glacial epoch. Then come the requirements of size, as to what is handy and convenient to produce and handle, as well as what kind of tooling will give the best effect, taking the character of the stone into account; some stones lending themselves to rough treatment and others again requiring the very finest treatment of the rubbing bed to bring out their special beauties. Now the question naturally arises as to just what we manufacturers have been doing in a practical way in our own chosen lines for the improvement, upbuilding, and elevating of our own vocations. The stone cutter, having long experience and a limited range, has pretty well exhausted his field; but how is it with the clay worker? The brickmaker, trying honestly to excel, has been laboring for as perfect a brick as possible, for sharp angles, straight lines, smooth surface, and even color, and in obtaining these he has achieved much success. Is this, however, all there is for him to do? Is this, indeed, the sum of and the height of his art, or is he possibly in a measure wasting his talent and time in a wrong direction? He seems certainly to have been satisfied in his own mind that these were the real requirements, but is it not just possible that he has been blind to or ignorant of some of the things you architects may have wanted? Is it not possible that you and he have not been close enough together; may not have fully understood each other's needs, as well as just what effects were wanted, and what ends were required? He is using a material which lends itself to change in a most marvelous fashion; which changes its form at a touch and yet holds the very imprint of the artist's thumb for centuries. A material that changes shape and size in the manufacture, for every clay, you know, shrinks in drying and again in burning, thus giving opportunity for warpage and consequent distortion — small, indeed, perhaps — of the plain surface, but, yet, which must be carefully considered. And is this not possibly fitted for a field of its own in which it shall not be an imitator, but shall stand original and unsurpassed? Nature has been very chary of polished surfaces, showing them only in mirror-like water surfaces, and had we not better confine them to glass, glaze, and the marble and granite from the rubbing bed?



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I cannot but think that we manufacturers have not kept sufficiently in touch with you, the active, practical designers. We should see more of you and talk more with you as to what you want to use, what effects you would like to produce; knowing these things, happily we may be able to produce what you want. Then, too, in our experimental work, we should be quick to detect a promising effect and not slow to show it to you and ask your opinion, for thus some of our accidents might bear fruit. But I fear we have been too much shut up with these ideals of shape of surface of some particular and very even color, that our predecessors have had, and we have been feeling our way, as it were, instead of pushing and originating. A brickmaker once, laboring honestly all the while to make as smooth a brick as possible with the sharpest possible edges and corners, had made up and piled in his yard to dry a lot of brick of which he was very proud, and which he considered as perfect bricks, having very sharp edges and corners, being especially smooth, and promising to be of a very even color. A rain storm coming up, however, dashed his hopes and, despite all his efforts to prevent it, washed off the exposed edges of these bricks, as well as all the sharp corners. The skies cleared and the bricks dried, only it happened that, instead of throwing them back into the pug mill, as had often been done before, this time they needed them to fill out the kiln for burning, and so they were put in and burned. When the kiln was opened these bricks, being without the well-known requirements of smooth, sharp edges, smooth surface, and even color, were dumped out of the way where it was hoped no one would see them, to be possibly used sometime for filling a back wall or some other ignoble, obscure use. There they lay, forgotten, until one day an architect, visiting the place on other business, was spending a little spare time looking around, noting the especial requirements of the material in its manufacture, that he might plan his work the more consistently and aptly in the use of this material, and thus work in harmony with the manufacturer, with the contractor, and with the workmen, and so all work to the common end of producing the best building possible, which is always our common purpose. On the round of examination and exploration the eye of the architect happened to spy out this pile of spoiled bricks, and he started to make a closer examination, against the protest of the manufacturer, who apologized for the rubbish, and explained that it was an accident, and tried to lead him away to a pile of perfect bricks. He knew these were uneven, all covered over with projecting warts and recesses, and of a very uneven color, even showing little stones, and generally having most of the defects he had been trying to avoid. But the architect would not be led. He hovered about that pile of rubbish, and, looking at one brick after another, his quick eye detected effects to be wrought by that chance material which were far beyond those of the smooth brick that were the manufacturer's delight. The result was that the pile of rubbish, gladly sold for a low price, formed the front for a handsome and striking house on a prominent city boulevard, and a new style of brick had been formed and made by accident and against — not by — the efforts of the manufacturer. To be sure, the architect knew a good thing when he saw it, but it was only the chance visit that brought it to his notice. The edifice built was like the vista of pines and waves over the bay, no two leaves alike, no two twigs alike, no two bricks alike, yet all similar and all in harmony.

Another manufacturer had a clay that bothered him, in that it was not pure; there were chunks of iron ore in it, and, try as best he could, he could not get them out, and his bricks, instead of coming from the kiln of the smooth, even color so much desired, came with ugly black blotches. But the enterprising architect found his way, luckily, into his establishment, and the result was the discovery and use of the speckled brick, and another new and rarely beautiful effect was added to the resources of the architect and to the line of clay manufacture, and a line that promises more effects for the future than possibly any other one branch.

Why must the manufacturer — the maker — the producer — wait for the accident of rain to roughen the surface of his ware so that

by that roughened surface the finished wall may have light and shade — high light and deep shadow — in pleasing variety? And why, when accident has happily shown him this very pleasant effect, and shown him, also, how quickly his brother in the architectural line seizes and uses this novel finish, — why, then, should the manufacturer wait, like Charles Lamb's Chinaman, for the house to burn down to give him roast pig? Should the manufacturer wait for another accident or go on and profit by the idea and make more without accident, but with firm intent? Should he not go even further and exercise all his talent for the production of other and further pleasing effects outside and beyond the one shown by the accident? If the one chance roughening produced an enhanced effect by its distribution of light and shadow, is it not probable, at least, that other and pleasing effects in light and shadow surface effects can be studied out and wrought by intelligent effort? And why not in color, too? It is true, color is a very dangerous element and will bear no trifling, but once strike the right key and the chord is rich and harmonious.

Walls have been built, and the fingers of time have worn them — the elements have tinted them. The showers and the tempests, the fogs and the soot all have contributed to toning and blending, to softening or brightening the picture. Vegetable or lichen growth has attached, and slight but beautiful color effects have been wrought, and we are amazed, and generation succeeding generation has admired and wondered. If we want a like effect, must we wait for generations later to enjoy it, or can we take the lesson from nature, and tone our wall with the slightest possible speckling of green or gray without being charged with making artificial antiquities? It is not imitation. It is emulation. Would not the same reasons prevent our decorating the interior walls? Must a terra-cotta house be red or else be said to be an imitation of stone, or can the parties in interest take advantage of the research and learning, of the thinking that has been done, and of the advancement made by reason of accident and by thought as well, and maybe say boldly, I like such and such tints (without being told that unless he can find them in stone they are not proper), and that he can go even further and say, I like a mass color, or I prefer a spotted effect? Perhaps his fancy is born of raindrops on the veranda floor; possibly from a distant vista of green lawn dotted with dandelions or white clover; no matter how formed, it is worthy of consideration, and augurs well for effect if studied faithfully and carefully.

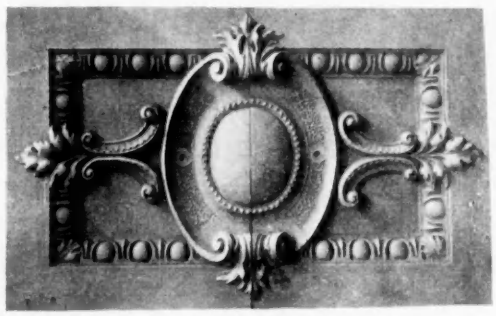
In clay there are certainly very many very promising possibilities in the line of a roughened surface texture by means of which very pleasing effects of light and shade may be obtained, and which is a very promising field for the exploration and research of the architect and manufacturer. While in the same material the possible color effects are practically without limit. This I firmly believe to be a field into which we have only taken the first few steps, a panorama of which we have only had a few fleeting glimpses, but of whose real diversified beauties we have as yet no proper conception, and yet I feel that we shall yet see many of these vistas and enjoy their beauties.

Why should we not learn from these chance happenings, and, noting these beauties, try to analyze them and make combinations that will be equally pleasing to the eye — not aping antiquity, and trying to make a wall appear different from what it really is; but, learning that a little fleck of color here or shade there adds to the general effect, why not use it and enjoy the beauty of the wall in our own generation, and then let posterity enjoy it as well?

We manufacturers have recognized this, I fear, to too limited an extent. Whatever chance we have given you, our architectural brothers, has been made good use of by you, quickly and intelligently, but it seems that these chances have arisen more from our accidents than as the result of our earnest research.

All that I have said relative to surface and color treatment, whether of brick or stone, applies equally to terra-cotta. While terra-cotta is a material that excels in duplication, still, by a proper surface treatment this duplication will not appear as such, and in color treatment in many cases absolute variety as well as entire harmony may be obtained. Terra-cotta lends itself to surface treatment so readily, however, that in absolutely original and individual effects there is no limit, and the field of its application is all the time broadening. Human nature is, however, so variable that none of us can tell what to expect in the line of criticism or praise. The general principles, broad and sound principles of art, will always command attention and admiration. Still, when the average citizen begins to try to analyze them, there is trouble, for, while he may recognize a good effect, he may not be able to explain the why and wherefore.

I recall a building in which I particularly prided myself on having carried out this idea of individuality to the extent of having no two pieces absolutely alike, and yet obtaining a color effect that had been universally admired. One party who was a great admirer of the effect, and had praised it and recommended it for use in



EXECUTED BY THE AMERICAN TERRA-COTTA AND CERAMIC COMPANY.

other places, added to his commendation, "But I would want all the blocks alike." He knew a good thing when he saw it, and yet was not able to analyze and find wherein the effect existed, but wanted to cut out the very thing that produced the effect he admired. Since then, whenever I get on high stilts over praise for an achievement, I keep a weather eye for a soft spot to fall on when some one knocks out the stilts.

The lesson from all this seems plain and pertinent, that the relationship should be closer. That we should cultivate the expression of the needs and requirements, and then give intelligent scope to our efforts to produce the things required. Nor should the manufacturer be at all backward about showing the architect any new chance acquisition he may happen on, as well as the result of his efforts to produce an effect which he was seeking. To you, architects, the lesson seems to indicate more freedom in expressing your wants and requirements, as well as more talks with the manufacturer and more frequent visits to the manufactory.

Let us all labor together, then, for effects in surface and color that shall lead to the erection of a line of noble edifices that shall stand as beautiful and enduring monuments, both to your greatness as designers and originators and to our skill as manufacturers. Monuments which, standing in beauty and majesty, shall remain as a joy and pride to this, as well as to succeeding generations.

ALTHOUGH the Chicago building ordinances restrict the height of buildings to about ten stories, yet permits which were rushed out before the present ordinances went into effect seem to hold good indefinitely, and, even though nothing but hasty sketch plans were submitted to obtain those permits, now, years after the permits were taken out, plans are made and buildings are erected at the pleasure of the owners. Several sixteen-story buildings are yet likely to be built under these old permits. But not to regard this as surprising or unjust, certain owners have had the assumption to claim the right to transfer a permit to an entirely different piece of property, and build a sixteen-story building on ground for which no permit has been issued.

Fire-proofing Department.

Constructed in the Interest of Building Construction to Prevent Loss by Fire.

FIRE-PROOF FLOOR ARCHES.

(Continued.)

BY GEORGE HILL, C. E.

PUBLISHED TESTS. — CONTINUED.

THE Columbian Fire-Proofing Company write, calling my attention to several points in the last instalment, which they believe do them an injustice. They claim that, by the use of rolled steel bars and by a complete knowledge of the material, they are building a very much better arch than the tests would show. They say: * * "The tests to which you refer were made at the very outset of our career and were made under the most severe conditions possible, as you will see by looking over the data. The concrete was green, the loads imposed were directly on the floor, clear of beams and without the strength imparted by floor strips, filling, and wooden floor, and the bars used were prepared by riveting the ribs on, as we had no special rolls at that time. * * * * Moreover, these floors were only calculated to carry the lightest loads, such as for apartment houses, etc., and the tests for heavier floors were made later on." * *

They claim that at the present time they have made tests which demonstrate beyond question the strength of their arch, and that, by the proper spacing of the steel ribs, a floor can be proportioned for carrying any load, there being no surplus or waste of strength in the making, and they further claim that they find a ready market for their product.

At the present time they are building several floors in New York, and promise to submit several sections of these to test. As a consequence, we shall defer further comment until these tests have been made.

In support, however, of the claims which they make, they quote certain tests herein below given: —

No. 41. A section 4′ 0″ wide, 7′ 5½″ span, containing 30 square feet, which carried an equally distributed load of 24,312 pounds or 810 pounds per square foot. Details as to deflection, character of material used for the loading, and sizes of bars are not given.

No. 42. A section calculated to carry 200 pounds per square foot, loaded with 810 pounds per square foot, no deflection, and then tested with a drop load.

No. 43. A test arch which carried 600 pounds per square foot, with a drop weight of 300 pounds from a height of six feet without failure.

Concrete and Twisted Iron. In connection with this subject, attention is called to the article appearing in the March and April numbers of THE BRICKBUILDER, in the concrete department, describing the methods adopted by Mr. Ransome, in his concrete-iron construction. This has already been sufficiently treated. It is mentioned here simply in order to make the record entirely complete. Other tests of different methods of concrete-iron construction will be referred to later on.

Metropolitan Tests. (Catalogue of company issued in June, 1895.) This system was formerly known as the Manhattan System, and is described as follows: Cables, each composed of two galvanized wires twisted together, usually using No. 12, are placed from 1″ to 1½″ apart, varying the distances according to the load which is to be carried. These cables are held by hooks or clips, which grasp the top flange of the beam and are made of No. 2 wire. They pass under bars in the center of the span, which give them a deflection of from 2½″ to 3½″, varying with the span between the beams and the load to be carried, 3½″ being the amount used for a 6′ 0″ span. Forms or centers are placed underneath these cables, and a composition made principally of plaster of paris and wood chips is poured on. As plaster of paris sets very quickly, the resulting floor is sufficiently strong to be used at once under loads, with a surface uniform and level with the top of the beams. Where a panel ceiling is used, permitting the beams to show, wire netting is stretched over the beams, and the same composition poured around them, fire-proofing the beam. Where a flush ceiling is required bars are placed on the bottom flanges of the beams and wire netting stretched over this, and a floor plate of about 1½″ in thickness is made by moulding on the material; this gives a covering to the bottom flange of the beam of 1″. The top flange of the beam is protected by covering it with some of the plastering material, and the finished slab is as shown on Fig. 15.

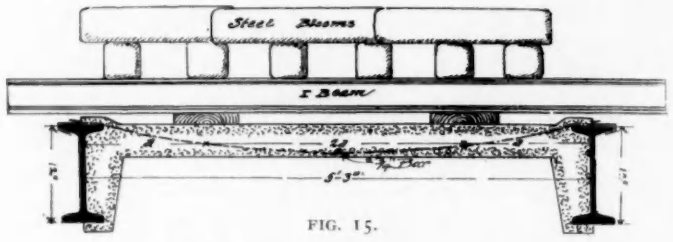


FIG. 15.

This ceiling plate is entirely independent of the floor, and consequently, when the floor plate deflects under a load, the ceiling plate remains intact. It also gives a void, which may be used for ventilation or for the purpose of carrying pipes around through the floor; this latter purpose, of course, being practically defeated by the necessity for framing into the girders at the end of the spaces. In regard to the fire-proof qualities of this material, it is said that when it is exposed to flame for a long time the composition is rotted to a depth of from $\frac{3}{16}$″ to ⅜″, the remainder being unaffected. If water is thrown upon it, the mass does not crack or fly. When made thoroughly wet, as would happen from water thrown into the building during the fire, the composition is not destroyed. During prolonged test, plates made of this material will remain cool on the surface not exposed to the flame. In the case of one test, snow remained unmelted on the upper surface of the plate, while the under surface was exposed to continuous fire for four and one half hours.

It is well known that plaster of paris, however, when subjected to heat has the sulphate changed to a sulphide, which is readily removed by water; as a consequence, alternations of flame and water on the same surface would probably lead to a disintegration of the surface, and if this should happen at the point where the covering of material is but ¾″ thick, as it is immediately under the bars in the center of the span, the arch would be liable to attack and failure, because the wires, by reason of their small mass, would very quickly heat up and draw out. This danger occurs, however, only in the event of the omission of the ceiling plate, and, as under all circumstances, except in warehouses where light is not especially necessary, the ceiling plate should be applied, the danger of failure is perhaps not very great. The ceiling plate, being supported by the wire netting, is, according to tests which have been made, almost impossible to burn through, and the consequence is that it would probably afford an efficient fire protection. Inasmuch, however, as none of the tests quoted by the Metropolitan Company describe how the water was applied — that is, whether there were alternations of water and fire, or fire on one side and water on the opposite — we do not know precisely what would occur. It may be that the unknown parts of the composition would have the effect of rendering both the wood and the plaster of paris proof against flame; this can only be determined by tests made for this especial purpose. Comparative tests were made by the company for the purpose of showing the value of the arch for this form of floor, as compared with the flat hollow-tile arches, and these tests are given in the tables following, being tests numbered from 44 to 58, both inclusive.

RESULTS OF TESTS OF FLAT HOLLOW-TILE ARCHES.

Number.	Distance between beams, center to center.	Clear distance between webs.	Depth of block.	Length of section tested.	Area tested in square feet.	Total load applied in pounds.	Load per square foot, in pounds.	REMARKS.
44	5′ 6 8/16″	5′ 5⅞″	9¾″	4′ 3¼″	23.445	4,536	193.5	The thrust of arch kicked out lower flanges of beams.
45	5′ 6 8/16″	5′ 5⅞″	9¾″	4′ 4½″	24.02	20,140	839	Failed suddenly from breaking of horizontal webs of blocks next to skewbacks.
46	5′ 7 8/16″	5′ 7″	9¾″	2′ 0″	11.17	5,670	507	Failed suddenly from breaking of horizontal webs of blocks next to skewbacks.
47	5′ 7 8/16″	5′ 7″	9¾″	2′ 0″	11.17	3,330	298	Failed suddenly from breaking of horizontal webs of blocks next to skewbacks.
48	4′ 10 8/16″	4′ 10″	10″	1′ 0¾″	5.135	2,900	564	Failed suddenly from breaking of horizontal webs of blocks next to skewbacks.
49	5′ 0 1/16″	4′ 11¾″	10″	4′ 5½″	22.2	8,599	387	Failed suddenly from breaking of horizontal webs of blocks next to skewbacks.
50[1]	5′ 2 18/16″	5′ 2⅝″	6″	4′ 5″	23.05	9,492	411	Failed suddenly from breaking of skewbacks and blocks next to skewbacks.

In test 44 tie-rods were placed through the centers of the webs of the beams, as is usual in practice; this was a test, therefore, of the ordinary manner of arranging tie-rods, rather than a test of the efficiency of the arch blocks.

In tests 45, 46, and 47 the arches were built between beams firmly held against lateral movement.

The arches were built from selected blocks and the work done with great care; they were laid in Portland cement mortar, composed of one part cement to two parts of good, clean, sharp sand. Except in tests 47, 48, and 49, the tops of the arches were leveled up with one inch of the Portland cement mortar.

In tests 47 and 49 no mortar was placed on top of arch, except to give the planks (load was applied same as in Metropolitan test, Fig. 15) even and horizontal bearings.

In test 44 the load consisted of brick applied as shown in Fig. 16. In tests 45, 46, 47, 49, and 50 the load consisted of steel blooms applied as shown in Fig. 15. In test 47 the load was stone blocks applied on planks as in Fig. 15.

[1]Test 50.— Instead of flat hollow tile, this section was built of six-inch hollow segmental arch blocks, with a rise of six inches; sufficient filling was put on top of the arch to give the planks on which the load rested even and horizontal bearings.

RESULTS OF TESTS OF METROPOLIAN FLOORS.

Number.	Distance between beams, center to center.	Clear distance between flanges.	Length of section tested.	Area tested, in square feet.	Total load applied, in pounds.	Load, per square foot, in pounds.	REMARKS.
51	6′ 10″	5′ 5″	2′ 0″	10.832	5,395	498	Did not fail.
52	4′ 7″	4′ 2″	1′ 0″	4.166	5,630	1,351	Did not fail.
53	6′ 2″	5′ 7″	1′ 0″	5.583	6,040	1,081	Did not fail.
54	5′ 5″	5′ 0″	9½″	3.958	7,600	1,920	Two cables on one side broke. The others were unbroken.
55	5′ 6″	5′ 0½″	2′ 6″	12.605	15,146	1,202	See note.
56	4′ 6″	4′ 0½″	2′ 6″	10.105	15,682	1,551	Failed by the breaking of cables on one side.
57	4′ 6″	4′ 0½″	5′ 0½″	20.38	29,314	1,438	Adjoining sections, being without load, lifted. No wires were broken.
58	3′ 9″	3′ 3½″	2′ 5″	8.229	18,950	2,302	Adjoining sections, being without load, lifted. No wires were broken.

Tests 51, 52, and 53 were made on sections taken at random in buildings where floors were being put in under contract and were not tested to destruction.

In test 55 the adjoining sections, being without load, commenced to lift; the section was not tested to complete destruction.

These tests are open to criticism as incomplete in data, and therefore cannot be properly investigated or fully interpreted. This is to be regretted, because but little is shown by the tests above quoted of what ought to be known positively of a new combination, and especially because, as I have before remarked, the combination of steel wire, representing the strongest form in which the metal can be used to take up the tension existing in the floor construction, with a fire-proofing material to take up the compression, fire-proof, and preserve the metal as well, is one that cannot be too highly commended on theoretical grounds, as it very closely approximates perfection. Under such circumstances, the more we can learn of the material, the more tests we can make of it, the sooner will we discover its weak points and eliminate them, and the greater the use to which it can be applied.

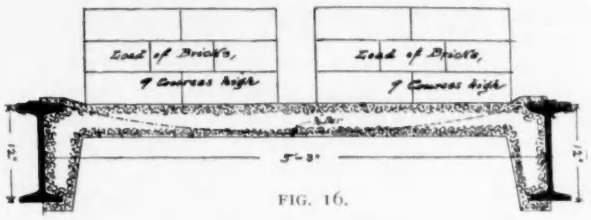


FIG. 16.

The advantages claimed for this system are: —

First. Its superior fire-proofing qualities.

Second. Its great strength and the manner in which it transmits the load to the beams, girders, columns, and walls.

Third. Its lightness, making its use of great economy, and reducing the loads on the foundations, in ordinary conditions, fully twenty-five per cent.

Fourth. That by its use it is possible to complete a building, so far as the fire-proofing is concerned, sooner than by using other fire-proofing systems.

Concerning those claims it is perhaps well to state: —

First. That the fire-proofing qualities may be admitted under certain conditions, but not entirely conceded as yet.

Second. The question of strength is by no means demonstrated. The method of applying the load in the tests which are relied on for proof is one which is objectionable, because it represents conditions very rare in actual practice, and because precisely what the strains are which exist in the mass by reason of the application of the load in this peculiar manner no one knows. Had the load been applied eccentrically, there is no doubt but that the arch would have acted very differently; had it been applied centrally in the center of the span, there would have been a direct test of the material, and its effect would probably have been to very much decrease the amount of the loads which were carried; had it been uniformly distributed by building up a crib of planks, which would be in a measure flexible, and applying the load to them so as to secure a true distribution, we don't know what the result would have been, but it is probable that no greater loads would have been carried than those herein noted.

The desirability of more complete tests is shown by noting that in the series of tests given for hollow-tile arches the greatest load carried was 20,000 pounds, while these arches were built, as is stated, from selected blocks. The writer in some of his tests, which will be subsequently given, has put loads in excess of 55,000 pounds on a single arch of about the same span and less depth, thus showing the variation in conditions and the great variation in results which follow therefrom. *Second.* Concerning the point of the manner of this floor's transmission of the load to the supports, it need only be said that where the floor is designed according to well-known engineering principles there is practically no difference between the method of transmission of the load for the various systems, since the floor-plate, itself in conjunction with the beams which form the abutments, takes up all of the strains, transmitting simply the vertical loads to the girders, columns, or walls.

Third. Its lightness. In support of this claim it is stated that * * * "When ready for the plaster underneath and the floor above, the weight is about 24 pounds per square foot, which is 40 to 70 pounds per square foot less than that of most other systems when leveled up in concrete ready for the floor. In the case of a modern building, 100 by 120 feet, twenty stories high, the saving in dead load would be about 60 pounds per square foot, making a total saving, exclusive of the saving in metal work, of * * * 7,700 tons. By using this system for a building of this size, not only would there be a saving of the metal work necessary to carry 7,700 net tons by the beams and girders to the columns, and by the columns to the foundations, but the foundation would have to carry less weight by 7,700 net tons plus the saving in weight of the metal work."

To one who is fully posted, this statement is a *reductio ad absurdam*, but as this may not be evident to all of our readers, we will take it up in detail, thus: First, consider that in any building, and

particularly in an office building, the only kind which would be carried up twenty stories in height, some area must be allowed for the space occupied by walls and courts; this would reduce the area considered and consequently the saving in weight by at least twenty per cent. Ordinarily an office building has about thirty per cent. of area occupied in this manner. Second. In considering what improvement can be effected by any new device, it should be compared at least with good current practice, and at the present time the weight of fire-proof floor arches ready for the finished floors, when the same are properly designed, is for arches ten inches in thickness, or arches for use with ten-inch beams, which corresponds with good conditions of column spacing, about 41 pounds per square foot. Now, in this case a flush ceiling is provided, which is an absolute necessity for good lighting conditions, such as would be required in the building under consideration. Therefore the corresponding weight for the Metropolitan floor, including the ceiling plate, would be about 34 pounds per square foot. These considerations, then, leave the savings on this very large building but 672 tons, and I believe that this probably fairly represents what should be obtained in the present state of the art. I do believe, however, that should complete tests prove that the material is reliable under commercial conditions, and possessed of sufficient compressive strength, that other forms can be devised that will materially save in weight, and that there is less opportunity for stupid designing in this material to needlessly increase the weight than exists with the use of the hollow tile. Of course I do not deny that there are many buildings in which the floor weights may approximate the amount given in the above quotation, but I do deny that they represent the best that can be done under the circumstances, or that they represent even fair practice.

Fourth. So far as the completion of the building is concerned, if Portland Cement is used with a proper design of hollow-tile arch, very much less water enters into the composition of the floor and it is consequently unnecessary to wait so long for it to dry out, and repeated tests have clearly demonstrated that these floors will carry heavy loads, even when laid up dry.

It would therefore seem as if it were quite feasible to design a hollow-tile floor so as to give a working platform ready for use just as soon as any panel of blocks had been set in position and the centers removed.

(*To be continued.*)

SLOW BURNING BUILDINGS.

PAPER READ BEFORE THE NATIONAL ASSOCIATION OF FIRE ENGINEERS AT MONTREAL.

BY WILLIAM MCDEVITT,

Inspector of Philadelphia Fire Patrol.

AT the last meeting of this association action was taken regarding the experience with and effect of fires in buildings erected on the so-called "slow burning" plan. Some criticisms have been made on the opinions expressed here by those favoring this method of construction, and, as this plan is being applied to buildings used for mercantile and light manufacturing purposes, such diversity of opinion forcibly illustrates the necessity of cooperation between architects and our fire officials. The latter want is being made more apparent and deserves more notice from this association than has been given it when viewing the responsibilities which are being cast upon fire officials in the inevitable destruction by fire through faulty architecture.

In the varied methods and combinations which have and are daily being adopted in building construction with a view of protection from fire, architects experienced in the difficulties met in fire fighting, in devising plans for a building, often introduce features which, in event of a fire occurring within it, may develop a disadvantage, tending either towards its destruction or acting as a barrier to the firemen. Such has been the experience and results in many instances with fires with the present plan of so-called "slow burning" mill construction, owing particularly to the feature of isolated floors. Instances may have occurred to substantiate the claims made for this plan of construction, owing, perhaps, to the aid of automatic or other extinguishing apparatus at hand, but in the absence of these auxiliaries, and the frequent occurrence of their failure when called upon, leaves the construction alone to be considered.

The term "slow burning," as applied to heavy timber construction, originates, no doubt, from the fact that with the burning of a small bulk of heavy timber the consumption appears to be slow, as less smoke and flame is given off than that from lighter kindling. But it must be remembered that in the burning of heavy, dry timber combustion is more perfect, the gases do not escape in the form of smoke, and the heat given off is far more intense than that from an equal weight of lighter wood. With a fire extending over a flat space of heavy timber, such as that of a ceiling of a large room, the intense heat accumulated over the entire plain will cause a rapid destruction of the inner part of the space burning.

The practice of isolating floors with a view of confining a fire in any kind of a construction, regardless of area or nature of contents, is not without its disadvantage and possible dangerous effect, causing, during a fire, a lateral spread of the heat, which, in the present period of lofty buildings facing each other on narrrow streets, is conducive to a conflagration. No better illustration of this latter danger can be seen than that afforded by a fire with headway in a structure built on the "slow burning" plan, with isolated floors.

In Philadelphia four or five buildings of this character have been burned in different sections of the city, and the extraordinary rapidity with which they were destroyed and the communicating of fire to surrounding buildings caused considerable comment, including criticisms on the efforts of the fire department.

Being personally present at the burning of four of these structures, the similarity in condition and results that followed in each instance was remarkable. It could be observed that the solid ceilings acted as a spreader for the fire at the beginning, distributing the fire over the broad surface of exposed timber, causing a spread of the fire and smoke, with no outlet but the doors and windows for the heat, which was ejected out with such force that where the fire originated either in the basement or lower floors the heat prevented any approach of attack, and in a few minutes burned the hose leading along the street and set fire to the buildings across streets sixty feet in width, causing in one instance a loss of nearly $400,000. One of the mills burned was fortunately located on an open lot; in this case it was impossible to approach within a hundred feet of the burning structure. It may be well to state that none of the buildings referred to were equipped with automatic sprinklers, but in two cases it is doubtful if such protection would have had any effect, owing to the highly inflammable character of the contents. Each were equipped with stand-pipe, water supply, and hose connections. In three instances the fire originated during working hours, and, notwithstanding prompt discovery, the rapid spread of the smoke and heat prevented the use of the appliances at hand.

With fires in buildings of ordinary construction, the elevator shafts, stairways, and other openings through floors, offer to a certain extent, an upward escape of smoke and heat. And with ordinary conditions, timely discovery, and prompt notice, burning buildings are accessible, and the daily experience proves that fires are either confined to a portion of the building or within the building itself. This opportune advantage, together with the forcing of ventilation in the upper part of a burning building (a method often resorted to by fire officials), is a feature that architects should consider and provide for in devising plans for fire-proofing with isolated floors, as a large area containing abundance of fuel and allowed to burn will wreck most constructions of the present day.

Experience seems to prove that the present plan of so-called "slow burning" mill construction, with isolated floors, is a deception as titled, and the erection or presence of buildings of such construction in thickly built quarters is conducive to an extensive conflagration in event of a fire occurring within them.

Mortars and Concrete Department.

Devoted to Advanced Methods of using Cements and Limes in Building Construction.

AMERICAN CEMENT.

BY URIAH CUMMINGS.

CHAPTER V.

A TREATISE on cements would hardly be complete without allusion to those cementing agencies which, although they can hardly be classed as hydraulic, as that term is now understood, were used in mortars and concretes centuries ago, and many specimens of which are still in a good state of preservation.

We refer to carbonate of lime and sulphate of lime, each of these being mixed with sand, clay, gravel, and finely broken stone. The latter having been used above, while the former was used both above and below ground. It is quite irreconcilable with our modern ideas as to the causes of the hardening of mortars, yet the fact remains that carbonate of lime has been made into a mortar by admixture with clay, sharp sand, and gravel, and after three thousand years is found to be as hard as a rock.

A paper by Dr. Wallace read before the Mechanics Institution, Glasgow, so completely covers this subject as to render a literal quotation desirable.

On Ancient Mortars. By WILLIAM WALLACE, Ph. D., F. R. S. E., F. C. S. From the *London Chemical News, No. 281.*

Having, by the kindness of William Clarke, Esq., C. E., who has recently returned from the East, been supplied with specimens of mortars and plasters from well-known ancient buildings in Egypt, Greece, Italy, and the Island of Cyprus, I have submitted a number of them to analysis, with the object of determining several points of interest. The ages of the mortars vary from about sixteen thousand to upwards of three thousand years, thus dating back to the most ancient historical periods. I propose in the present notice to give the results of the analysis of such of the specimens as I have examined.

Mortar of the Great Pyramid.— Two specimens of mortar from the Pyramid of Cheops were examined, one being from the interior, and the other from the outside of the structure. That from the interior was from the great chamber or the passage leading to it. Both specimens present the same appearance,— that of a mixture of plaster of a slight pinkish color, with crystalized selenite or gypsum. They do not appear to contain any sand, the silicic acid being evidently in combination with alumina as clay. Part of the selenite was probably burnt, and the result mixed up with burnt lime, ground chalk, or marl, and coarsely ground selenite. The latter would act the part of sand in our mortars, *i. e.*, prevent undue contraction in drying. The quantity of water is almost exactly what is required to form the ordinary hydrate of sulphate of lime with two equivalents of water. The mortar is easily reduced to fragments, but possesses a moderate degree of tenacity. Prof. C. Piazzi Smyth, who is at present making explorations in the pyramid, and to whom I have communicated the results of my analysis, has informed me that large quantities of gypsum and alabaster are found in its vicinity; and that some enormous slabs of alabaster or selenite have been discovered lining the walls of a large tomb recently opened. The material of which the pyramid itself is constructed being limestone, there is no difficulty in accounting for the presence of the lime.

	INTERIOR.	EXTERIOR.
Sulphate of lime, hydrated	81.50 [1]	82.89 [1]
Carbonate of lime (CO_2 calculated)	9.47	9.80
Carbonate of Magnesia (do.)	.59	.79
Oxide of iron	.25	.21
Alumina	2.41	3.00
Silicic acid	5.30	4.30
	99.52	100.99

[1] Water by actual estimation, 16.66, 17.38.

Ancient Phœnician Mortars from Cyprus.— Two specimens were obtained from Cyprus. The first is from the ruins of a temple near Larnaca, the highest stone of which at present remaining is five feet below the level of the ground, and the lowest about eighteen feet. Mr. Clarke supposes this to be the most ancient mortar in existence, and it certainly is one of the best I have ever seen. It is exceedingly hard and firm, and appears to have been made of a mixture of burnt lime, sharp sand, and gravel, some of the fragments being about half an inch diameter. On solution in hydrochloric acid, it gave a small quantity of soluble silica, amounting to .52 per cent.

The other specimen from Cyprus is a cement used for joining water pipes.. These pipes were found near Larnaca, ten feet below the surface of the ground, and bear evidence of extreme antiquity; they are of red clay, about eleven inches in diameter, and are connected by spigot and faucet joints, the intervening spaces being filled with the cement, and afterwards coated with a black substance which was found to be bitumen. This mortar or cement is very hard and perfectly white in color. It will be observed that in both of these Phœnician mortars the lime is almost completely carbonated.

	TEMPLE.	CEMENT.
Lime	26.40	51.58
Magnesia	.97	.70
Sulphuric acid	.21	.82
Carbonic acid	20.23	40.60
Sesquioxide of iron	.99	—
Alumina	21.6	.40
Silicic acid and fine sand	16.20	.96
Coarse sand	3.37	—
Small stones	28.63	—
Organic matter	.56	.24
Water	.54	3.09
	100.26	98.39

Ancient Greek Mortars.— The first specimen is taken from a part of the Pnyx, the platform from which Demosthenes and Pericles delivered many of their orations. It has been long exposed to the action of the weather, is very hard, and of a grayish-white color. The other specimen is plaster from the interior of an ancient temple at Pentelicus, near Athens. It has not been exposed to the weather, the temple being in a cave; it is of a pale cream color, and moderately hard. The analytical results are the following:

	PNYX.	TEMPLE AT PENTELICUS.
Lime	45.70	49.65
Magnesia	1.00	1.09
Sulphuric acid	—	1.04
Carbonic acid	37.00	38.33
Sesquioxide of iron	.92	.82
Alumina	2.64	.98
Silicic acid and sand	12.06	3.90
Water	.36	3.07
	99.68	98.88

In the mortar from the Pnyx the carbonic acid is exactly the amount required by the lime and the magnesia, supposing both to be completely carbonated; in that from the temple the carbonating is nearly but not quite complete.

Ancient Roman Mortars.— These differ from those already mentioned in being evidently prepared by mixing with burnt lime, not sand, but puzzuolana, or what is commonly, although improperly, called volcanic ash. Of these, four specimens were examined, but two only of the analysis were completed, owing to deficiency of material. The first in the following table was taken from Adrian's Villa at Tivoli, near Rome; it is a tolerably hard and firm mortar, of a rather dark-gray color.

The second is plaster from the interior of a wall at Herculaneum; it is hard, evidently exposed on one side to the action of hot volcanic mud, and of a red tint. The third specimen is from the roof of the

Latin tombs near Rome, of a pale reddish-brown color. The fourth is a cement or mortar from a mosaic forming the floor of the baths of Caracalla, Rome. All these mortars were hard and firm, and contained an appreciable amount of silicic acid in combination: —

	ADRIAN'S VILLA.	HERCULANEUM.	LATIN TOMBS.	MOSAIC.
Lime	15.30	29.88	19.71	25.19
Magnesia	.30	.25	.71	.90
Potash	1.01	3.40	not estimated.	
Soda	2.12	3.49	not estimated.	
Carbonic acid	11.80	23.80	13.61	17.97
Peroxide of iron	4.92	2.32	1.23	3.67
Alumina	14.70	2.86	16.39	10.64
Silicic acid and sand	41.10	33.36	36.26	30.24
Organic matter	2.28	1.50	—	2.48
Water	5.20	1.00	8.20	5.50
	98.73	101.86		

General Remarks. — These analyses appear to show that the lime in mortars and plasters becomes, in the course of time, completely carbonated, and does not form a combination consisting of $CaO,HO + CaO, Co_2$, a conclusion that has been arrived at by some authorities. They also show that in all cases where the mortar is freely exposed to the weather a certain proportion of alkaline or earthy silicate is formed, which in all probability confers additional hardness, and that those mortars are the hardest which have been long below ground. It is well known to builders that those walls are strongest that are built during a rainy season, and that when mortar dries quickly it becomes crumbly and possesses little binding power. When kept wet for some time, a small proportion of silicate of lime will be formed, which will not only make the mortar itself harder, but will unite it more firmly with the stone. It is curious that the mortar which is probably the most ancient (the specimen from a Phœnician temple) is by far the hardest and firmest; in fact, like a piece of rock. It is a concrete, rather than a mortar, and its excellence seems to indicate that a large-grained sand is best for building purposes, and that even small gravel may, in certain cases, be used with advantage.

(*To be continued.*)

AMERICAN PORTLAND CEMENT.

PAPER READ BEFORE THE MASTER BUILDERS EXCHANGE OF PHILADELPHIA, MAY 28.

BY WM. G. HARTRANFT.

THE remains of great engineering and architectural work in Egypt and parts of Asia and Europe prove that ancient and extinct civilization was familiar with the use of cement. Mr. Henry Reid says: "These remains, of a varied and interesting character, even now show us how much of their stability and permanence is due to the quality of the cementing agents by which the building materials were put together."

The experiments conducted by Mr. John Smeaton in the years 1756 and 1757 for a reliable mortar for building the Eddystone Lighthouse, and the experiments carried on by Dobbs, John, Vicat, St. Ledger, Palsley, and Frost in the early part of this century, and the taking out of patents by Joseph Aspin, of Leeds, Eng., in the year 1824 for the manufacture of what he called "Portland Cement" show that the men of the eighteenth century did not possess as much knowledge of hydraulic cement as the men of ancient times.

Mr. Aspin's Portland Cement, so called because the artificial stone made from it resembled the Portland Building Stone of England, was manufactured under the following patent: "My method of making a cement or artificial stone for stuccoing buildings, water works, cisterns, or any other purpose to which it may be applicable (and which I call Portland Cement) is as follows: I take a specific quantity of limestone, such as that generally used for making or repairing roads, and I take it from the roads after it is reduced to a puddle, or powder; but if I cannot procure a sufficient quantity of the above from the roads, I obtain the limestone itself and I cause the puddle, or powder, or the limestone, as the case may be, to be calcined. I then take a specific quantity of argillaceous earth or clay and mix them with water to a state approaching impalpability, either by manual labor or machinery. After this proceeding, I put the above mixture into a slip pan for evaporation, either by heat of the sun or by submitting it to the action of fire or steam conveyed in flue pipes under or near the pan, until the water is entirely evaporated. Then I break up said mixture into suitable lumps and calcine them into a furnace similar to a lime-kiln, until the carbonic acid is entirely expelled. The mixture so calcined is to be ground, beaten, or rolled to a fine powder, and is then in a fit state for making cement or artificial stone. This powder is to be mixed with sufficient quantity of water to bring it into the consistency of mortar and thus applied to the purposes wanted."

That this process of late years has not always been honestly followed in England will be seen by a letter which I will read, which was sent out by the attorneys of one of the largest cement manufacturers in England to other manufacturers.

LONDON, Oct. 26, 1894.

DEAR SIRS: — We are desired to call your attention to the following circumstances, seriously affecting the trade in which you are engaged. It is becoming notorious that several manufacturers of English Portland Cement are largely adulterating their manufacture by the mixture of Kentish Ragstone, other stone, furnace or oven ashes, disused or exhausted fire-bricks, or other inert material, and so bringing disrepute on the good name English Portland Cement has hitherto borne in comparison for quality with cement of foreign manufacture. Such practices are so detrimental to the best interests of the cement trade, both by the discredit which is thereby attached to English manufactures and the unfair competition in prices thereby rendered possible, that it is now proposed to form an Association of English Cement Manufacturers for the purpose of dealing with and, if possible, putting a stop to a practice so unprincipled and disreputable and so calculated to perpetrate an injury to the trade. We are instructed to inquire if you would be willing to join an Association of Cement Manufacturers for this purpose, and, if so, we shall be glad to hear your views on the subject, and to know if you would attend a meeting presently to be convened. We are, gentlemen,

Your obedient servants,

RENSHAW, KEKEWICK & SMITH.

A detailed report can be found of this meeting, which ended without accomplishing any result, in the issue of Nov. 23, 1894, of the *London Fairplay*. The German Association of Cement Manufacturers require that Portland Cement shall be made by calcining an intimate mixture of calcareous and argillaceous materials as chief ingredients and subsequently grinding the calcined mixture to the fineness of flour.

Mr. David O. Saylor, the pioneer manufacturer of Portland Cement in this country, said: "In order to make Portland Cement, it requires a homogeneous mixture, containing in proper proportions carbonate of lime, alumina, silica, and iron. This mixture must be subjected to a heat sufficiently high to produce a vitrified, dense, and heavy clinker, and afterwards ground to very fine powder. The induration or setting of Portland Cement consists in the formation of a real mineral, of a crystalline rock species, which appear to be analogous to natural zeolites. This fact can be confirmed by miscroscopic examination of a true Portland Cement. The set will be found to consist of translucent and, to some extent even, of transparent crystalline particles of different forms, exactly like those of the zeolites of nature."

It will be seen by the above that the early manufacturers of Portland Cement in England, Germany, and America were of one mind as to the constituents of a good Portland Cement, and with the

American's genius, and the unlimited deposits of the purest cement-making rock found in the world, it is not surprising that American cements are of the best quality.

At the present time the bulk of the English cement is manufactured from chalk, instead of the hard limestone. This chalk is mixed with clay in the proper proportions before burning in a large wash mill, and the slurry is then run off and dried, either by artificial means or sun evaporation. The only difference in the burning now and in Aspin's time is that this dried slurry is now burned to a hard clinker, instead of just expelling the carbonic acid gas. Works were started for the manufacture of Portland Cement in Germany, France, and Belgium soon after the works were established in England. In the former countries it is largely made of an argillaceous limestone or a marl. This material is usually ground and mixed in a dry state, dampening only sufficient to mould into a brick, so as to facilitate the loading of the composition into the kilns.

The Portland Cements of Europe did not begin to find their way to this country until about 1865, and from 1865 to 1870 small quantities were shipped here and sold at from $8.00 to $10.00 per barrel. This large price and the increase in demand for this cement attracted the attention of Mr. David O. Saylor, who was then manufacturing at Coplay, Pa., a light burnt, hydraulic cement, commonly known on this market as Rosendale, and he decided to make a Portland Cement equal to any made in Europe out of the argillaceous limestone found at Coplay, and which in the latter part of the year 1874 he succeeded in doing. Although this was fifty years later than the industry was started in Europe, the American product at once took first place on large engineering work, where great quantities have been used.

Major-General Gilmore, after testing and inspecting the cements at the Centennial Exhibition, said there were thirteen brands of foreign and one American Portland Cement exhibited, and that the American brand[1] stood among the five best specimens. In 1878 Capt. J. B. Eads selected an American Portland Cement with which to build his great work, the "Concrete Mississippi Jetties," using 12,000 barrels alone in this one operation. It is worth noting, while we are reading from time to time in the engineering journals of concrete work in Europe disintegrating under the influence of the salt and waves of the ocean that these concrete jetties at the mouth of the Mississippi River, which have successfully withstood the action of the salt and waves of the Gulf of Mexico, are made of Portland Cement,[1] manufactured within sixty-five miles of Philadelphia. The great concrete docks, which the city of New York has been building for the past eighteen years have been largely made of American Portland Cement.[1]

American Portland Cement was also used largely on the big masonry dams and aqueducts[1] of the Croton Water Supply for New York; in the foundations of the Brooklyn Bridge;[1] in the Hudson River Tunnel;[1] the Niagara Tunnel; in the foundations of the new Manhattan Life Insurance Co.'s Building, New York (twenty stories high); in the new Capitol Building, Albany, N. Y.;[1] in the Concrete Jetties at Sandy Hook[1] and is now being used by the United States Government on the new Post-Office Building at Washington, D. C., and in the concrete sea walls being built at Brooklyn, League Island,[1] and Norfolk Navy Yards. Among the large buildings in Philadelphia built with American Portland Cement are: The Drexel Building, the Drexel Institute, Provident Building, Girard Building, Harrison Block,[1] Pennsylvanian Railroad Station, Philadelphia & Reading Railroad Station,[1] Odd Fellows Temple, Women's Medical College, Bourse Building, and new Hotel Walton. (Last two under construction.)

With such monuments to the durability of American Portland Cement, it is almost inconceivable how an engineer or architect can feel justified in drawing his specifications in a manner so as to exclude the American manufacturers from competing for their work; yet there are many men who have charge of the erection of buildings which in the aggregate consume as much Portland Cement as the large engineering operations who do not permit the American Portland Cement to be used. If this rejection of a native product for one of foreign manufacture was done after a careful comparison of the quality of the two materials, and the native cement found wanting in any good particular possessed by its foreign rival, the American manufacturer would not complain, but such rejections are simply because it has the misfortune to have been made by American labor and out of lime, silica, and alumina found in this country, rather than Europe; as comparisons which have been carried out in a large and impartial manner have proven beyond question that the American Portland Cements, as a class, are equal to the foreign cements.

In proof of this, I will cite a few instances: In the report of the Engineer Commission of the District of Columbia for the year ending June 30, 1893, we find there were seven German, two English, and five American brands of Portland Cement submitted on government work in Washington and carefully tested by the commission. The two cements which proved to be the strongest, when tested neat and with sand mortar and the finest ground, were both American Portland Cements. In the report of the Water Commission of St. Louis for the year ending April, 1894, where 80,000 barrels of Portland Cement were recently used, we find tests on fifteen brands of Portland Cement, carried out for two years, and that among the four best brands was one made in this country. In the annual report of the Director of Public Works of Philadelphia for the year 1893 we find that two of the strongest and finest cements used were American brands. From over 6,000 tests made by the Survey Department of Philadelphia, on cements being supplied to city work during the year 1894, we find that the average strength of the American Portland Cements in neat and sand mortar was in excess of any of the foreign cements. The different foreign cements figuring in these various reports are the best European brands, many of which cost in this market from 25 to 50 cents per barrel more than the American Portlands, although the latter have proven to be so much superior. With these facts and figures in your possession, the American manufacturer asks the builders and contractors of this country to assist in bringing to the attention of the architects and engineers the fact that in using foreign cement they do not get the best quality, and are wasting their clients' money.

In the year 1894 there were nineteen factories in the United States which make about 700,000 barrels of Portland Cement, this amount being but 18 per cent. of what was imported. The largest factories are located in Lehigh County, Pa., in the neighborhood of Coplay. All the factories located in this region make cement under the dry process from an argillaceous limestone. There are several factories in New York State, along the Erie Canal, and in Ohio where marl and clay, or limestone and clay are used. Practically, nine tenths of the Portland Cement manufactured in this country is made in the States of Pennsylvania, New York, and Ohio. Other States where small quantities are manufactured are Texas, Colorado, Dakota, Oregon, California, and the Territory of Utah.

There is plenty of raw material suitable for making the highest grade of Portland Cement in almost every State in the Union, and with the proper encouragement from our architects, engineers, and builders, there is no reason why all the cement needed in this country should not be made at home.

[1] Saylor's Portland Cement.

BRICK-DUST MORTAR. — The use of brick-dust mortar as a substitute for hydraulic cement is now recommended on the best Spanish engineering authority, experiments made with mixtures of brick-dust and quicklime showing that blocks of one half inch in thickness, after immersion in water for four months, bore, without crushing, crumbling, or splitting, a pressure of 1,500 pounds per square inch. The use of brick-dust mixed with lime and sand is said to be generally and successfully practised in the Spanish dominions, and is stated to be in all respects superior to the best cement in the construction of culverts, drains, tanks, or cisterns.

The Mason Contractors' Department.

Conducted in the Interests of the Builder and the Contractor for Brickwork.

A TALK WITH THE CONTRACTOR.

IN looking over the present condition of the mason builder's business throughout this country, we cannot but notice, however hard we may try not to do so, the general incapacity of the journeyman bricklayer. Nearly every large contractor of brickwork has in his employ some men who are worth all or more than they are paid, some who earn possibly the equivalent of their wages, and some who, no matter how rough the work may be, never earn for their employer as much as their wages, and it is of this latter class that we complain.

They are always behind time, always in the way of better men, never do anything right, cannot carry a corner and keep it plumb, cannot even lay brick on the line without "crowding" it; their window and door jambs resemble stairs, on account of their roughness; they "whitewash" the work, to use a truthful phrase, both outside and in; they strike about half their joints and these are generally only partially filled with mortar; they never have the inside and outside of the wall on the same level, always roll their brick the wrong way so as to leave a "lip" on the under side, put the poorest side of a brick out, cannot turn the simplest arch and have it true; in short, cannot do any piece of work even after it has been laid out for them and do it in a first-class manner. Strange, isn't it, that men who claim to have served a three or four years apprenticeship, have been journeymen for years, and are worthy (?) members of the "union" should be so absolutely lacking, and have the face to expect as much pay as the most skilled mechanics? Right here I want to emphasize what I believe to be one of the greatest drawbacks of unionism as at present conducted. It undoubtedly tends to pull the good men down and bolster the poor ones up, thus putting all on the same level, consequently discouraging a higher standard of labor. Did you ever look at it in that light, brother builders? A man may be worth much more than "union" wages to his employer, but still he must not receive a cent more than the fellow who isn't worth his salt. Why do not the unions adopt a graded system of excellence, and have a man paid according to his worth?

There are many good bricklayers who know what a brick is and how to lay it, but that is about the limit of their knowledge. They understand a plan about as well as the Hebrew language; couldn't lay out a piece of work if their life depended on it. Many mechanics who pretend to be good bricklayers have never served a regular apprenticeship, but have picked up what little they know — and it's often hard to tell what that little is — from observation, and blunder along, trying to palm themselves off as journeymen. Surely, some of them would never stop their journey as far as bricklaying is concerned if contractors would do their duty.

It is a fact to be deplored that so few American boys are learning the mason's trade; but it must be conceded that American boys, as a rule, prefer to stand behind a counter at six dollars a week, where they can keep their hands soft and clean, than to learn a trade, especially that oldest and noblest of all trades, "masonry." What a great mistake they make. In three or four years they could place themselves in a position to earn two or three times as much as can be secured in the same length of time behind desk or counter.

But, alas! "what fools these mortals be."

IN modern building some of the greatest achievements of engineering skill have been carried out chiefly in brickwork, and in some instances to the entire exclusion of stone. This being so, it will not be out of place to consider the essential conditions of what is now universally accepted as being worthy the name of *good brickwork*.

Of the importance and necessity of solidly bedding the bricks and effectually flushing up the interior joints, no one is so fully alive as the practical brickbuilder. Apart from flushing up the brickwork as a means of obtaining the maximum amount of tensile strength, in addition to that obtained by good transverse and longitudinal bonding, to carry the loads to which most walls are subjected, and to provide against the possible lateral movement of any of its parts when the whole is under strain, the question has its sanitary aspect also. The walls of dwelling-houses defectively flushed up are really air filters on a large scale. They are liable to be receptacles of damp, driven in by the storms and induced by the hollow, or partially hollow state of the brickwork, leading up to disease, and in some cases probably fatal consequences.

The old saying that "a wet building makes a dry house" is worthy of all acceptance. Walls built wholly of dry or insufficiently wetted bricks will be found wanting in two chief characteristics of good work, viz., solidity and a firm and binding adhesion of the bricks and mortar. This is nowhere better exemplified, on the one hand, than in old brick footings and walls in situations subjected to the continuous presence of adjacent moisture. Many retaining walls, for instance, supporting an undrained or badly drained bank of non-porous earth, in which case the chemical action set up between the sand grains and the lime has gone on so uninterruptedly that the mortar has crystalized and attained that condition known to practical men as water-bound brickwork. The extreme opposite case is that of building walls with dry bricks in the height of summer. The dust coating the bricks is unremoved, forming a separating medium or layer between the bricks and the mortar, and so preventing adhesion. And where dust is not present the moisture of the mortar is taken up with avidity by the dry bricks, that very little or no adhesion is the result, and the mortar by examination when dry is found to be little better than a cake of slightly moistened, compressed dust. On the other hand, the bricks should not be wetted to a degree of saturation, or they will be incapable of absorbing the finer particles of mortar into their bodies, which they should do, forming so many threads binding the bricks and the mortar together. Unless the bricks be well wetted to induce the mortar into the cross joints and wall joint during the operation of flushing up every course, the work should be grouted. But under any conditions and circumstances the bricks should be wetted before use, except in winter or frosty weather, when the air is generally so humid as to reduce the absorbent power of the bricks. It is then advisable to forego the risk of wetting the brick, especially if the work is in exposed situations.

EFFICIENT as many of our workmen have become in after life in the handiwork portion of their craft, it is a fact that many are found uninformed and wholly deficient in the scientific principles and knowledge on which the whole superstructure of their handiwork rests for stability. It cannot but be evident that this condition has been a drawback and an encumbrance to the prosperity of many a competent workman.

In this department of THE BRICKBUILDER we shall endeavor to place before him such useful and practical information that, if properly utilized, will add greatly to his prosperity, and which he should possess to be considered a proficient and reliable mechanic. The writer has found, as a rule, from his own experience as a mechanic, that when the workman has ventured to pass his judgment in regard to the construction and stability of certain kinds of work pertaining to his art, in the presence of those who consider that they have been particularly educated to possess such knowledge, that his opinion, rather than being received with respect by them as being of any reliable authority, was looked upon with rather a contemptuous good humor, and placing the mechanic in rather a ridiculous and humiliating position before those contemplating or erecting an edifice. As a rule, works upon construction are generally written in an abstruse and perplexing manner to the practical mind of the me-

chanic, and designed more for those who work with the pencil, rather than he who labors with the trowel, and too expensive for him to procure, but THE BRICKBUILDER endeavors to overcome that difficulty by presenting practical information in a plain and intelligent manner. Almost any journeyman, at the rate of wages he receives, can afford to invest $2.50 per year for the practical ideas contained in THE BRICKBUILDER, and contractors would do well to encourage their men to keep abreast of the times in this manner.

THE relations of an architect and the mechanic are so intimately connected with the successful construction of a building, and the foregoing remarks explaining the qualification that should be possessed by the latter are such that his association with the latter in the management of an edifice would be most agreeable. Therefore, every mechanic should take a pride in cultivating and enlightening his mind on the scientific principles of construction; and by so doing he will not leave himself, as is often the case, to the mercy of some picture drawer, whose knowledge of sound and durable construction is of the flimsiest and most clerical nature. R. N. BUELL.

EDITOR BRICKBUILDER:

Dear Sir,— In your May issue appear two very interesting articles on mortar, showing the evils that exist in that very important and frequently neglected material that enters into the construction of a building. As an officer in a company whose business is the manufacture of mortar, it has been my privilege to go into this question to a greater extent than is usually done by a builder or any mechanic. Our plant, which was started about three years ago, turns out daily from two hundred thousand to eight hundred thousand pounds of mortar, for both bricklayers and plasterers, and we find the best lime to use for general purposes is one which contains a considerable amount of magnesia, a pure carbonate not giving the setting qualities desirable. Our lime is received almost daily, from three to ten cars a week, varying with the season. This lime is shipped in box cars and unloaded into bins. We have four slacking machines or revolving pans, into which about twelve bushels of lime are placed and enough water introduced to slack without burning. The pan is started and the lime is kept in motion by a mechanical arrangement consisting of three feet on a perpendicular shaft. When the slacking is complete a plug is removed, and the lime and water carried by a trough through three screens into a well; from this well it is pumped into vats located in the upper floors of the mixing-house. Screening the lime eliminates all core or underburnt limestone, stones, and other foreign matter so injurious to mortar, especially that used by plasterers.

When the lime and water is pumped into the vats it much resembles thick milk, which, after standing three weeks, assumes the consistency of soft cheese. Water is allowed to stand in these vats, which further aids in the slacking of any minute particles that have escaped through the sieves, and also to prevent the air from reaching it.

When mortar is to be made this lime paste is carried to the mixing pans, which are like those used in slacking, with the exception that they have two sets of feet, sharp, clean bar sand is also placed in the pans and the machine thoroughly incorporates the lime and sand into a homogeneous mass, not a streak of lime and a streak of sand, but a material of uniform evenness. As a result of this care, I have tested brickquetts made of machine mortar and have obtained as great a tensile strain as fifty-two pounds to the square inch; in twenty-seven or twenty-eight days, out of three brickquetts broken, I secured forty-eight, fifty-two, and fifty pounds tensile strain. We never allow lime to air slack; neither do we mix the sand with the hot lime and allow it to stand.

Good mortar, like every other good product, cannot be made by ignorant labor, which may or may not be honest, and never produces, exactly, twice the same results.

It has always been most astonishing to think that the very sinews of a building, the mortar which holds it together, is very generally placed in the hands of unskilled and almost unthinking men. It is covered up during the progress of the work, and, should a wall get out of plumb or fall down altogether, the blame is always attached to everything and everybody possible; to the mortar, never.

Before building assumed the proportions that it has during the last decade, work was done more slowly and better, on the average, than it is now, especially in the house-building line. But in the mad rush to become rich, the desire of many is to erect houses, "skinning" wherever possible, covering up poor construction by paint and paper and then disposing of the house for whatever profit is possible, leaving an ignorant and innocent purchaser with a miserable building to repair.

Foundations laid in mud with bricks laid in whitewashed, sand-plastered walls, kept together by highly decorated paper, are seen in every city where municipal legislation does not prevent by punishing the offender. It seems to me that the immense amount of money which is constantly being placed in new buildings would be sufficient cause for the enactment of State laws to make bad building a crime and to fix standards for every material used in the erection of any structure, especially those adapted for dwelling-houses.

Yours respectfully, HENRY LONGCOPE.

Secretary Quaker City Mortar Co.

LEGAL POINTERS.

KNOWLEDGE, NOT CONTRACT, NECESSARY TO A LIEN. — The Common Pleas Court of New York City holds that where work is done and materials furnished for a building with the knowledge and consent of the owner, a lien may be obtained for same, although the party claiming it made no contract with the owner.

CHANGE OF MATERIAL BY ARCHITECT AND SUBCONTRACTOR. — Where subcontractors use a different material in the erection of a portion of a building from that specified in the contract, by agreement between them and the architect, without the knowledge of the contractors, the latter are not liable for damages because the substituted materials were defective.

PENALTY. LIQUIDATED DAMAGES. — A stipulation in a building contract that the contractor shall pay ten dollars as liquidated damages for each day of delay in the completion of a building should be construed as a penalty, and the owner cannot complain of the action of a court in allowing him part of his claim for delay, on the theory that it was a claim for liquidated damages.

SURVIVING PARTNERS MUST COMPLETE CONTRACTS. — As a general rule, where a partnership has entered into a contract, and one of them dies after it has been partially performed, his death does not absolve either party from performance, in the absence of an express stipulation to that effect; and the existence of the partnership, with its active functions to be exercised by the surviving partner, is continued until the contract has been fully performed.

RIGHT TO LATERAL SUPPORT. — By the law of the land, an owner of real estate has the right to all above and all below it; and, consequently, may do as he pleases with his own. But his right is subject to the qualification that he must not exercise it to the detriment or injury of an adjoining owner's right. An owner has the right to his own soil, but no more than a neighbor has to his soil. Therefore it is that, in using or exercising this property right, no injury must be done to the other's right. This is a maxim of the law. Hence, when an owner commences to dig a cellar or otherwise along the division line between his land and that of a neighbor (which he has a perfect right to do), he must take care to protect the soil of the latter from crumbling or falling, by its own weight, into the cavity. If he make such protection, then the land of the neighbor has received no injury, but if such protection be not afforded, he is answerable for all damage resulting from such neglect; for "among the rights which adjacent proprietors of lands may have to enjoy the benefit of their contiguity is that of having one parcel laterally supported by the other. It is a right incident to the ownership of the respective lands, rather than an easement which one has in the other."

Recent Brick and Terra-Cotta Work in American Cities.

A Department Devoted to the Interests of the Manufacturer.

CHICAGO is still an infant in architecture, even though she has a right to pride herself on the origin of "skeleton construction," which has made possible the erection of twenty-story buildings on soft, sandy clay.

True, this great infant sprawls over ground seven miles wide by twenty-six miles long; but in this area are included many unoccupied gaps, even prairies. The miles upon miles of cheap structures scarcely worthy the name architecture, and the fact that her two or three dozen skyscrapers are all grouped in one spot, in a radius of five or six blocks, and that her important public buildings and fine residences are but a fraction of those in Boston or New York, make Chicago indeed seem but small and but a beginning (let us hope) of what she will be in architecture.

To speak of recent brick and terra-cotta in office buildings would be to mention a long list, for it is scarcely more than a decade since the first one was finished. The names of the "Home Insurance," "The Rookery," the mammoth "Masonic Temple," the "Woman's Temple," and others are familiar to all visitors. Reference will be made here only to some of the most important office buildings finished within a year.

It may be remarked that, aside from the "Auditorium Building," none of the large office buildings have fronts entirely of stone. Several have the first two or three stories of granite or buff Bedford limestone, and the upper part of terra-cotta, or brick with terra-cotta trimmings. The "Columbus Memorial" has the lower stories covered with solid bronze work. The "Reliance" has thin slabs of red granite facing for the first story columns, overlaid with Gothic tracery in bronze. The "Champlain" has cast-iron overlay on brown mottled terra-cotta in first and second stories. The iron is to be painted or gilded.

Some years ago several unhappy attempts were made in designing iron façades. The only recent instance of an iron front is the

CORNICE OF THE CHICAGO STOCK EXCHANGE.

A. M. Rothschild & Cos'. large department store which (on the wish of the owner, not the architects) has an all cast-iron facing from sidewalk to cornice.

Perhaps the entirely successful exterior for an office building is yet to be designed. There exist extremes and various gradations which are instructive.

We see above the bronze work of the "Columbus Memorial" Building an over-ornamental facing of terra-cotta, terminating in a confusion of tower, gables, eagles, and torches. On State Street, nearly opposite the "Columbus," stands the "Champlain," a striking contrast. Above the first two (black iron on brown terra-cotta) stories the fronts are a dead white terra-cotta, with such an effect that the first syllable of "Champlain" has been replaced with a word

MARQUETTE BUILDING.

Holabird & Roche Architects. Face brick furnished by Chicago Hydraulic Co. Enamel brick furnished by Tiffany Pressed Brick Co. Terra-Cotta furnished by Northwestern Terra-Cotta Co. Fire-proofing furnishing by the Pioneer Fire-proofing Co.

usually represented by a blank. The building is offensively plain to incite such profanity.

Near the "Champlain" stands the "Reliance." The front shows more plate glass than anything else — a point appreciated by scores of owners of old buildings, who are having their fronts torn out and replaced with larger plate-glass areas. And in the light of the fact that dozens of the old buildings are so desperately dirty that they are being painted over — brick and fine cut stone alike — a notable feature of the "Reliance" is the terra-cotta, which is all glazed, and, being cream-white in color, presents the appearance of a porcelain building. A semi-annual water bath will make this building always new. The Northwestern Terra-Cotta Co. are to be congratulated on the uniformity of results obtained in the color and the glaze. The owner of the "Reliance" very kindly showed the writer one of his ideas embodied in suites of doctor's offices having central reception-rooms. Mr. Hale has furnished these suites handsomely throughout, including dental chairs, instrument tables, and cases. A physician can have the use of a handsome suite, including bath, one hour per day for twelve dollars per month. In one of the upper stories is a neat little prescription drug store, making the conveniences quite complete.

The Fort Dearborn is one of the buildings delayed by the panic nearly a year after the drawings were made, but it came in on the May schedule this year.

Whatever may be said of the exterior design of this building, the color is certainly an unfortunate yellow.

The material is all brick and terra-cotta, except the bases of the first story piers, which are cast iron, and the granite entrance columns.

There is a certain similarity in the plans of office buildings, but the always varying combination of size and shape of ground, location of entrance, elevators, light court, second story bank and proper entrance to same, make an ever varying problem. The Fort Dearborn had several disadvantages to be met in planning. The site is small and there is no alley approach for freight or fuel. But altogether the result is successful; there are no dark rooms and the building is renting well.

The Stock Exchange belongs to the season of '94 (office buildings can be designated like bicycles, since it takes only eight or nine months to build one). Mr. Sullivan's design may be called unarchitectural, and otherwise be criticized, but the fact remains that his work has a most remarkable individuality, and this building commands the admiration of everybody — unless it be jealous cities. The entire front is of terra-cotta in a warm yellow-gray, which is the most popular and certainly the best terra-cotta color in use in Chicago.

By permission of "Ornamental Iron."

CHICAGO STOCK EXCHANGE BUILDING.

Adler & Sullivan, Architects. Terra-Cotta furnished by the Northwestern Terra-Cotta Co.

The "Old Colony" Building is one of the most successful designs yet made as far as the exterior is concerned. The lower stories are stone and the upper ones are Eastern Hydraulic colonial-yellow brick, with nearly white lintels, sills, and mullions. The interior of the entrance is too restricted and gives an instructive lesson in comparison with the New York Life entrance, which is similar in plan. (The New York Life was published a year ago.)

The finest office building in Chicago is the "Marquette." In size it is immense. The color of the exterior is a dark brown and the design in detail and general effect is good. Some of the canons of art are violated, but when the result is so good as this no apology is offered, when constructive reasons in a business building put a column on the axis of the main entrance. The violent entasis of the granite columns is more disagreeable than the lack of a "void on the axis."

The building is handsomely finished in mahogany and Italian marble. The main entrance vestibule gives a curious effect, with its single marble column in the center and beams radiating toward the elevators. It is richly finished in mosaic and white marble. Large balustrade panels at the second floor level are emblematic pictures in mosaic, having a strong green effect. The ceiling panels between white marble stiles are white mosaic with pale pink and greens intermixed in delicate patterns. The exterior panels over the entrance doors are bronze high reliefs representing historical scenes in the life of Marquette.

D. Everett Waid.

COLUMBUS. — Unlike many of her sister cities, Columbus is having a very "slow season" this year. Ours is one of those wealthy, steady-going cities not much affected by hard times, and yet something — or many things — make this year rather an inactive one, so far as building is concerned. A tour of the architects' offices elicits the information below as to work just let or about to be contracted for.

Messrs. C. A. Stribling & Co. have completed drawings for a Protestant hospital. This building is to be four stories high, including a basement, the whole designed on classic lines. The structure will be fireproof and modern in all its appointments; the exterior walls will be of brick and terra-cotta.

Architect Riebel reports drawings completed for a five-story wholesale block, to be 187 by 187 feet. The building will be fire-proof throughout; and the exterior walls, buff-pressed brick with terra-cotta trimmings.

Messrs. Mills & Goddard have designed a large plant for the Rarig Engineering & Equipment Company. The buildings are all fire-proof, the largest one being 638 by 127 feet in size. The walls are of buff brick inside and outside. The same firm have just completed for the Arion Club,—a male chorus of fifty business men,—preliminary designs for an auditorium to seat five thousand people, a full report of which will be sent in a later letter.

Other architects inform us that they will have interesting work to report next month.

DETROIT. — "The rush is over," is the answer of the architect to the contractors who are persistently inquiring "how is business?" In fact, it is only too true, and, unless some of the proposed buildings materialize, persons having frequent occasions to visit the architects can easily note the increasing amount of signs, "Office moved to residence," which already appear on the office doors of a number of minor architects.

The Detroit Street Railway Co. have purchased a site, and will

erect three car barns; buildings to be of brick, each 325 by 80 feet, and from fifty to seventy-five miles of track, for which the city compels them to use brick between, as being the most durable and beautiful material that could be used for that purpose.

Parties are negotiating through a prominent real estate firm for a site on Grand Circus Park on which to erect a handsome office building and concert hall. A deal is now pending, the purchasers having options on several pieces of property, with instructions to buy. No plans have been made as yet, but a building of the above description has been decided on.

ROCHESTER.— Building is expected to boom this year; but it is taking a good while to do so. But the small towns in this vicinity are nearly all having some large buildings erected.

Hamilton, which was burned out a short time ago, is rebuilding, and Mr. O. K. Foote has let contracts for a building which will

EXECUTED BY THE GLENS FALLS TERRA-COTTA CO.

accommodate nearly the whole town. It is to contain Masonic Hall, banquet and dancing halls, offices, flats, etc., and is three stories, 75 by 200 feet. Mr. Foote has also drawn a bank for same town, which will be erected soon.

Elmira will build a city hall, and Wolcott, a new union school, and many of Rochester's architects are trying for both.

Messrs. Nolan, Nolan & Stern, one of the best-known firms of architects in the city, have removed from Wilder Building to the new Chamber of Commerce Building (which was designed by them) and are fitting up beautiful offices for their accommodation.

The New York Hydraulic Pressed Brick Company have found that that building is in a good place and more convenient to the architects' offices, and have removed their offices and samples of their stock from 220 Powers Buildings to fourth floor Chamber of Commerce Building.

The corners of St. Paul and Main Streets are becoming a "sort of Architects' Exchange." There are now over half a dozen firms in the two office buildings on these corners, and "still there's more to follow."

It is rather surprising that more office buildings are not being erected. In this class of building there is chance for good investment, as one may see by the way the buildings recently erected were occupied. Much of the office space is spoken for in advance, and most of the other less desirable offices are filled up as soon as ready for tenants.

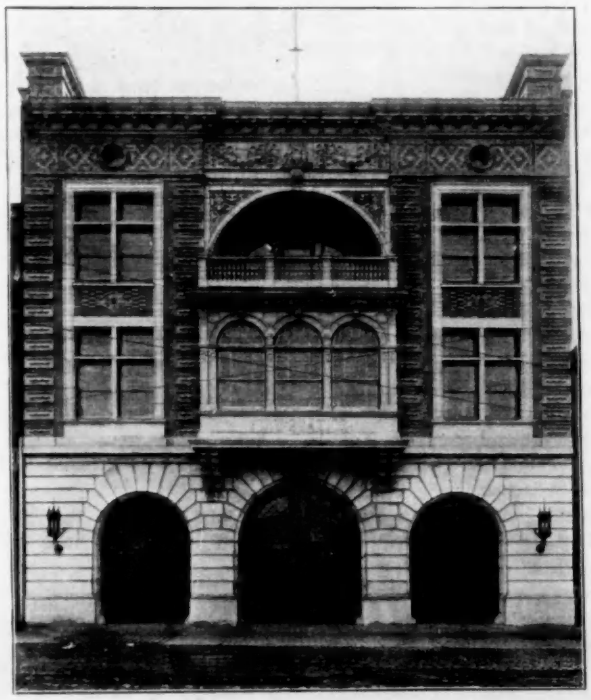
The Rochester Athenæum and Mechanics Institute opens its annual exhibition to-day, and a better display of work by the pupils of the school will be exhibited than has been heretofore. The results of three competitions which are about to be judged will be announced soon, and will be of considerable interest to Rochester draughtsmen, many of whom have entered one or more of them. The subjects are "Pen and Ink Drawing from Photo," "Cover for *The Athenæum*," and a "Wrought Iron Elevator Enclosure."

PHILADELPHIA has, during the year just passed, built several fire and police stations; the one shown in our illustration is situated on Market Street near Twenty-Second, and is probably the most successful of them all.

While they are not "all that could be desired," they are so very far in advance of the usual style and methods of construction, which ruled in preceding years, that they are worthy of notice as probably a turning point toward the better, both in design and general construction; and it would seem that those in command of such affairs are becoming willing to put a reasonable amount of money into a site and building for the purpose required, and not cramp them upon a fourteen-foot lot, as was customary several years ago.

The building shown in the cut is built with a base of Indiana limestone, and two upper stories of buff bricks and gray terra-cotta; the diaper patterns are in one instance of buff and light brown, and in the other buff and white bricks; the projecting bay is of galvanized iron, but the crowning cornice is entirely of terra-cotta.

The interior has been fitted up in the best manner possible with the funds in hand; every convenience available has been adopted.



FIRE STATION, PHILADELPHIA,
John T. Windrim, Architect.

There has been no attempt at fire-proofing; the floors are of the usual joist construction, except the first, where the architect has introduced the Fawcett flooring for the purpose of carrying the weight of the heavy engines, and to furnish a more durable floor for all practical purposes than had heretofore been used.

The architect, Mr. John T. Windrim, has taken a step forward in the several buildings entrusted to him, which we hope will prove only a stepping-stone to future undertakings, and which should exert a beneficial influence upon the heads of some of the other city departments.

The new building for the City Trust Company, or, rather, the addition to their present building, will soon be in hand. Architects Wilson Eyre, Jr., and Frank Miles, Day & Bro., associated, have had the work of preparing the drawings under their direction for several months, and they are about completed. The façade of the present building is one of the most beautiful in the city, and one of Mr. Eyre's best and most successful designs (if any one can be said to be better than another), and the addition contemplates the repetition of the present front, with the exception of the first story, which will be altered so as to make a scheme of triple arched openings possible; one of which will be the entrance to the office-rooms in the upper floors, and one the entrance to the banking-room of the company. The top of the building, which at present is a large gable, will also be slightly altered to make the completed building look as one whole.

There is considerable newspaper speculation as to what use the lot on the corner of Walnut and Juniper Streets will be put; as the craze is for high buildings, the reporters have it that a large apartment house will be erected thereon. The architect, Mr. Percy Ash, has, however, been instructed to draw up and he has finished the preliminary drawings and studies for a fine restaurant and café; and the probabilities are that it will be erected shortly. The building will be three stories high, built of brick and stone in the Elizabethan style, and the first floor will have a large ladies' café with glass roof over.

It is to be hoped that this building will soon be a reality, for there seems to be a growing need for just such an one in this locality.

Mr. Ash is the winner of the Traveling Scholarship of the University of Pennsylvania Architectural School, and will finish this work before going abroad to take up his travel and study.

FORT DEARBORN BUILDING, CHICAGO.

Terra-Cotta furnished by the Winkee Terra-Cotta Co. Fire-proofing furnished by the Empire Fire-proofing Co.

GREATER PITTSBURG.— The sound of the saw and the hammer is again heard in all parts of the city and suburbs. Building is more active than since 1893. In anticipation of a good year, much activity is displayed in labor circles connected with the building trades, and while there will probably be some demands for a change in the wage scale, no serious differences are expected. A meeting of Bricklayer's Union No. 2 was held recently, at which it was determined to make an attempt to have the $4.00 per day scale generally adopted.

It is reported that a syndicate will erect a handsome fire-proof hotel, at a cost of about $800,000, on Duquesne Way or at Bellefield, for which Henry Ives Cobb is preparing plans. Longfellow, Alden & Harlow have prepared plans for a hotel building to be erected on Fifth Avenue, at a cost of about $100,000. Geo. B. Post is preparing for D. E. & N. G. Park plans of a fifteen-story office building, 120 by 120 feet, and to cost $700,000, to be erected on the old post-office site. J. S. Stern for D. H. Hostetter, an eight-story brick and stone office-building, cost $500,000, to be at the corner of Grant and Fourth Avenue.

Charles Bickel, for the city of Pittsburg, Department of Public Safety Building, to be eight stories, brick and stone 50 by 150 feet, and to cost $200,000. Architect F. H. DeArment is in consultation with some capitalists concerning a project of immense proportions, in the shape of a free bridge over the Allegheny River, from Fifth Street to Arch; at either ends will be nine-story arcades for business and office purposes. It is contemplated to erect an exchange building; it will cost about $150,000. The North Presbyterian congregation will erect a new church building to cost about $50,000. W. Ross Proctor has prepared plans for a store and office building, to be erected on Center and Highland Avenues, for J. B. Stevenson, to be fire-proof, 50 by 150 feet, four stories, built of pressed brick and to cost $75,000.

A $70,000 building is being arranged for by the Church of the Ascension congregation, on Ellsworth Avenue. The Bank of Pittsburg building, designed by George B. Post, is now under way; the building will cost, complete, $156,000. Thomas Boyd is preparing plans for the Beaver College Building, to be built at Beaver, Pa.; cost, $30,000.

J. L. Beatty has prepared plans for the First U. P. Church, of Wilkinsburg; it will be of brick and cost $30,000. There is talk of a $75,000 business block on Fifth Avenue, McKeesport. Bartberger & East are preparing plans for a five-story factory for R. B. Ward & Co., on Liberty Avenue, of slow-burning construction.

MINNEAPOLIS.— Building matters are very quiet with the architects here, for this season of the year, but, as has been already said, "the Northwest will probably hold off this year to allow other sections to catch up with our improvements."

There is a great deal of work in the sketch stage, which will

probably materialize later in the season, and there is good reason to believe that the latter end of the season will find us very active. The majority of the work now being done is small and would not properly come under the head of this article.

Among the more important projects under way and fully decided upon may be mentioned the following: —

Guaranty Savings & Loan Co.; two-story banking building for their exclusive use, 35 by 105 feet in size, in Renaissance style, to be of pressed brick with sandstone trimmings and strictly fire-proof.

Regan Brothers will take estimates within a few weeks for a brick bakery building, 55 by 150 feet; two stories and basement, stores in first story and bakery in second story. Walls to be faced with pressed brick and brownstone trimmings. A feature of the bakery will be the use of white enameled brick for the inside of all walls, also shower baths and private rooms for the bakers, so as to insure the greatest cleanliness throughout. Cost, $10,000. Architect not selected as yet.

"Emerson Court," apartment building for Eric Lund, from plans by H. W. Jones. To be 100 by 165 feet in size, four stories and basement high, of solid brick with red pressed brick facings (Hydraulic Press Brick Co.) and brownstone trimmings. To contain forty-eight flats finished in most complete manner, with steam heat plant, etc. Cost, $125,000.

Congregational Church at Decorah, Ia.; 72 by 80 feet, to seat six hundred. Walls faced with St. Louis granite, pressed brick and stone trimmings. To cost $15,000. Architects, Orff & Joralemon, of Minneapolis.

Same architects have made plans for a Baptist Church at Mason City, Ia., 89 by 84 feet, to seat eight hundred. Walls faced with St. Louis pressed granite brick and stone trimmings; hollow brick lining for walls to be of Pioneer Fire-proof Co.'s make. Cost, $20,000.

We are making great strides, both in our design and construction, and our clients are daily learning the true value of fire-proof construction, especially for office and business buildings.

The masonry on our new court house will soon be complete, and I hope then to give a good description of this immense undertaking in a future letter.

ON Plate 41 and 42 we illustrate the beautiful new Jefferson Hotel, of Richmond, Va. Messrs. Carrère & Hastings, architects.

The exterior is almost entirely of white brick and terra-cotta, furnished by the Powhatan Clay Manufacturing Company. These brick have that uneven surface which is so much desired by architects, and are burned to nearly a flinty hardness, making them almost absolutely impervious to moisture.

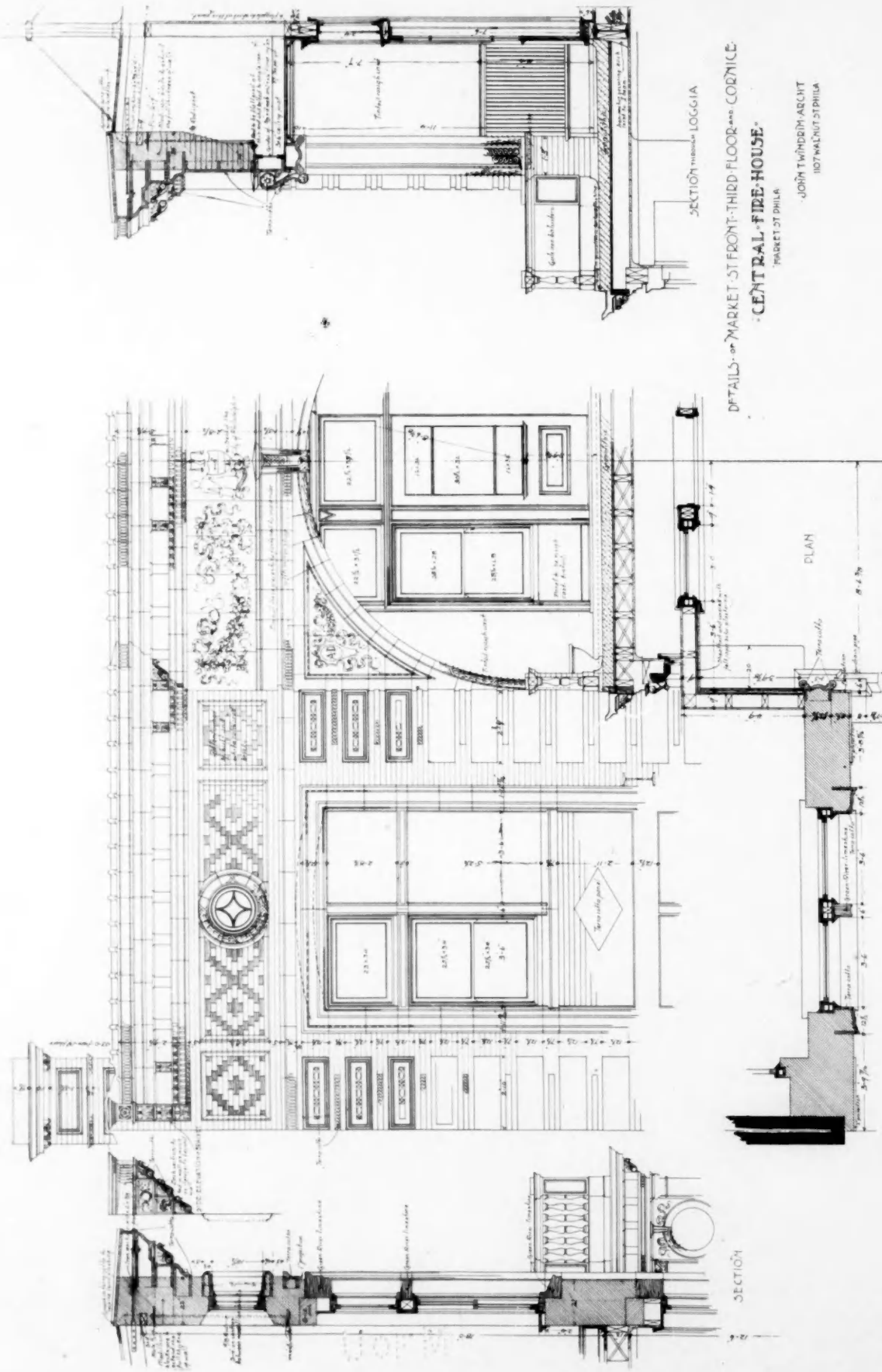
This is, without doubt, one of the handsomest hotels in the country, and its white brick walls add very materially to the general charm of the design.

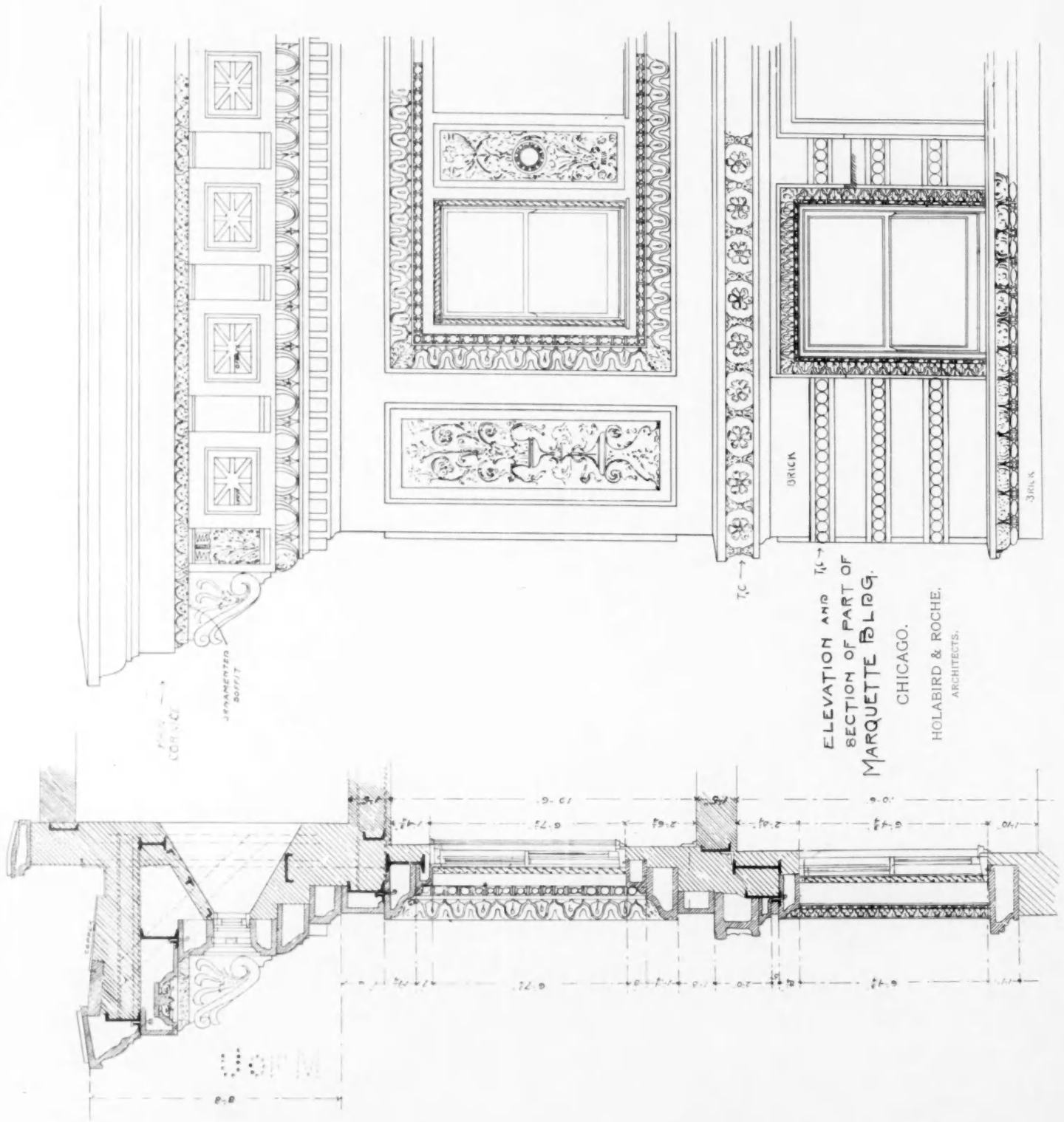
THE entire plant and property of the Akron Vitrified Pressed Brick Co. has been sold to the Akron Hydraulic Pressed Brick Co., which is one of the plants of the "hydraulic" family.

The beautiful color of the well-known Akron red brick needs no further mention at this time. We understand it is the present company's intention to add a number of new shades to colors now made.

The company has a storage house on the Valley tracks and will carry a stock for quick delivery. They will also handle mortar colors, flue linings, copings, chimney tops, etc.

THE Garry Iron & Steel Roofing Co., of Cleveland, has just shipped a large iron building and covering into Texas.


DETAILS OF MARKET ST FRONT-THIRD FLOOR AND CORNICE
"CENTRAL FIRE-HOUSE"
MARKET ST PHILA
JOHN T WINDRIM ARCHT
1107 WALNUT ST PHILA
SECTION THROUGH LOGGIA
PLAN
SECTION


ELEVATION AND
SECTION OF PART OF
MARQUETTE BLDG.
CHICAGO.
HOLABIRD & ROCHE,
ARCHITECTS.
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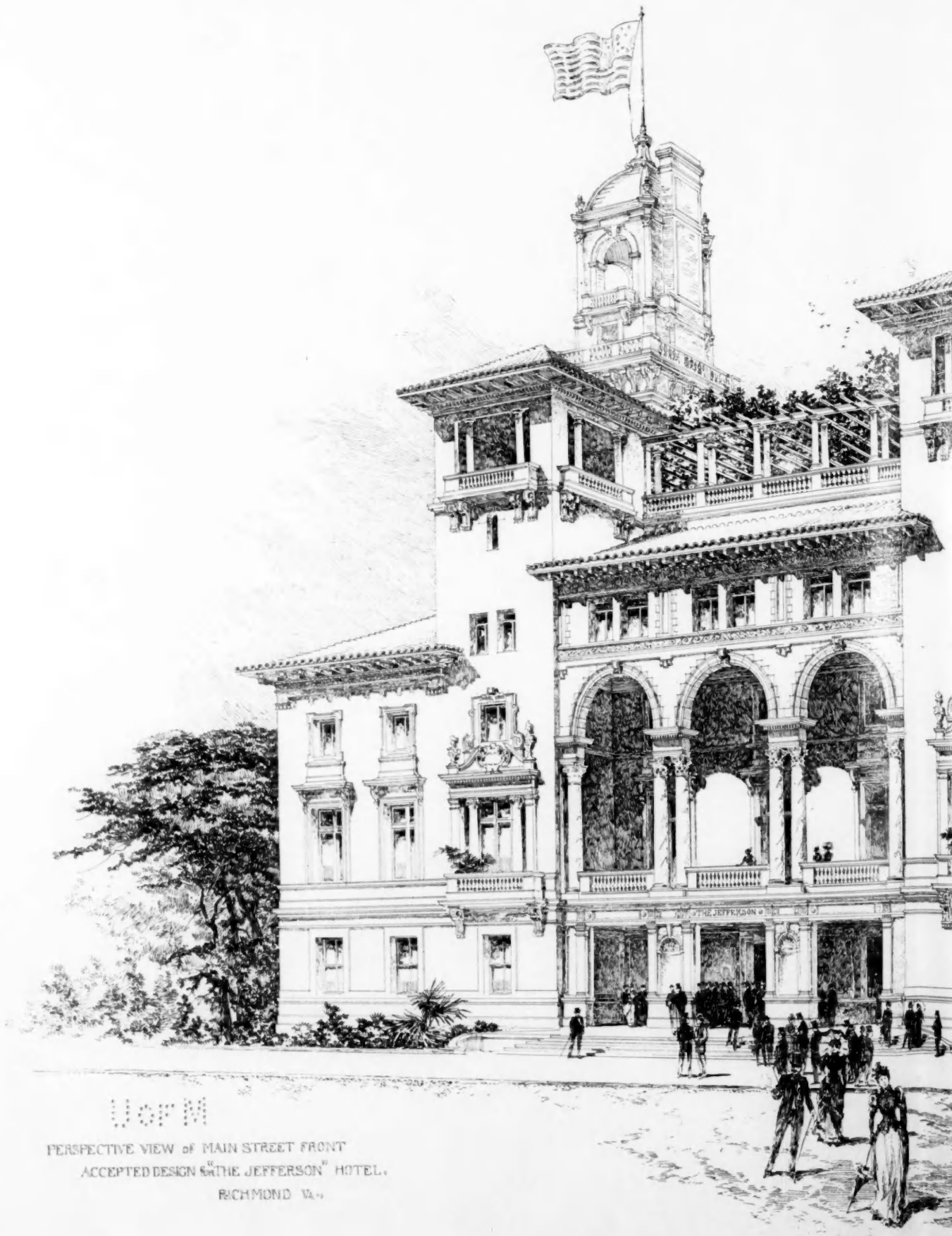


U of M

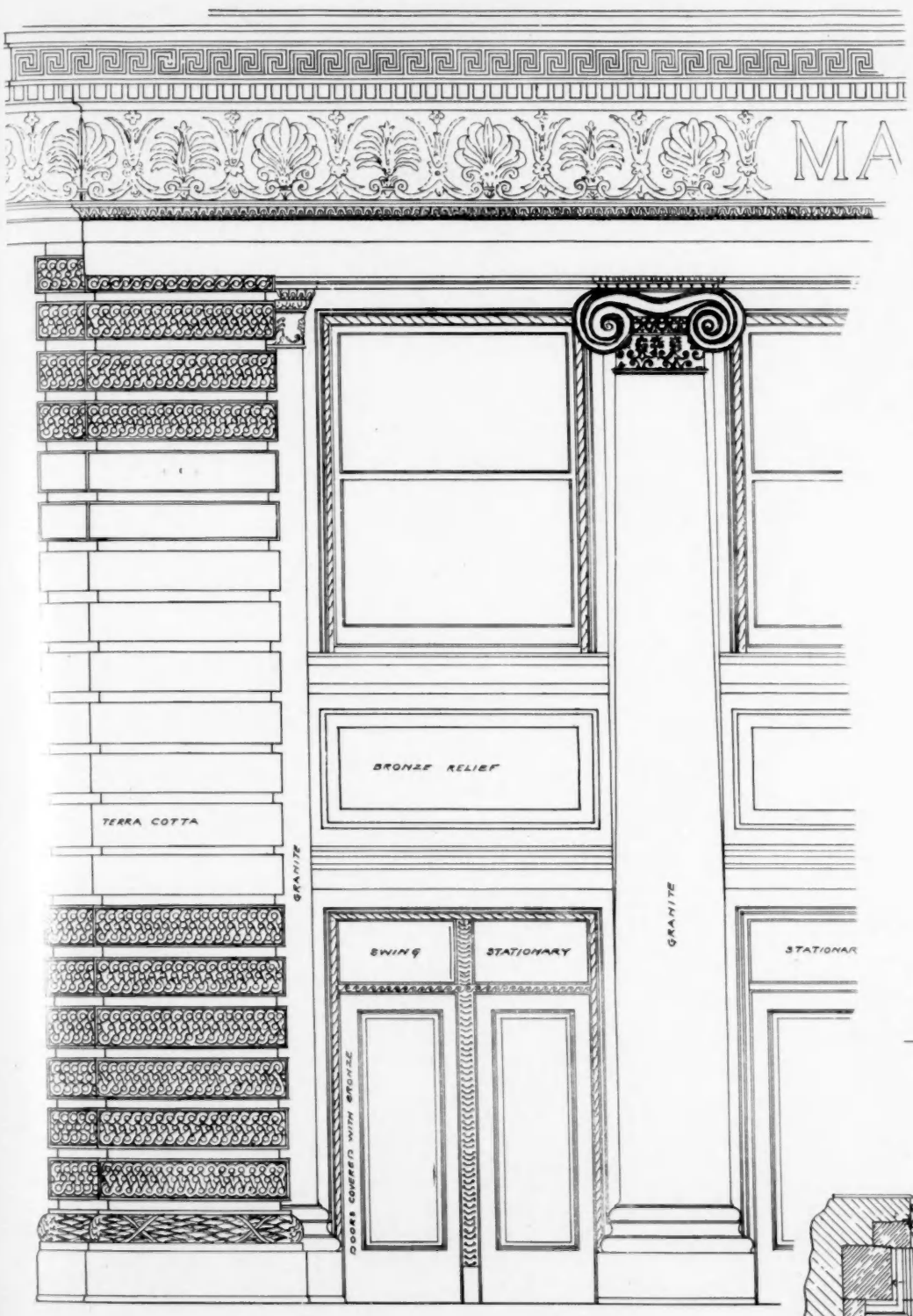
PERSPECTIVE VIEW of MAIN STREET FRONT
ACCEPTED DESIGN for "THE JEFFERSON" HOTEL,
RICHMOND Va.

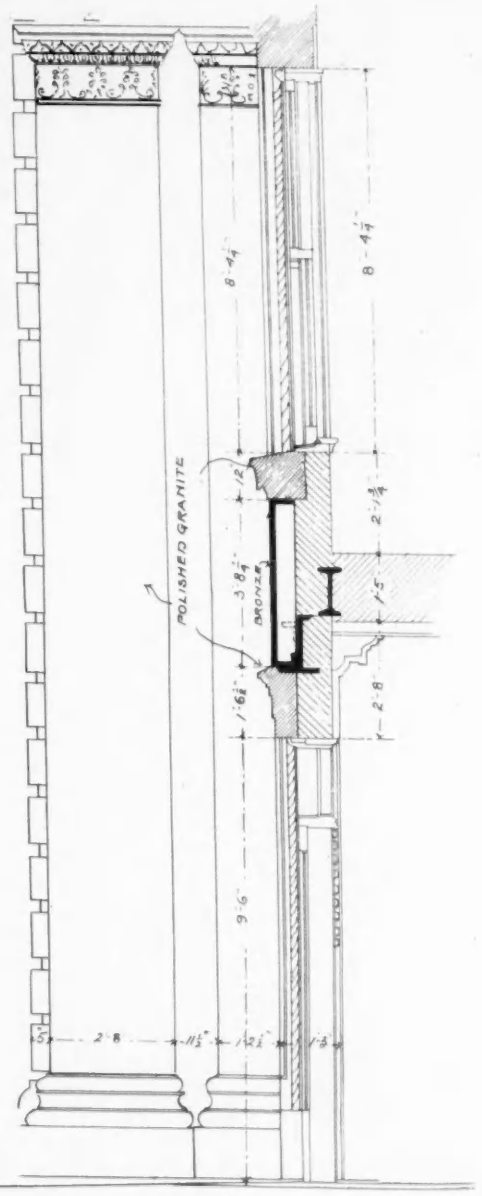
PLATE 41 AND 42.

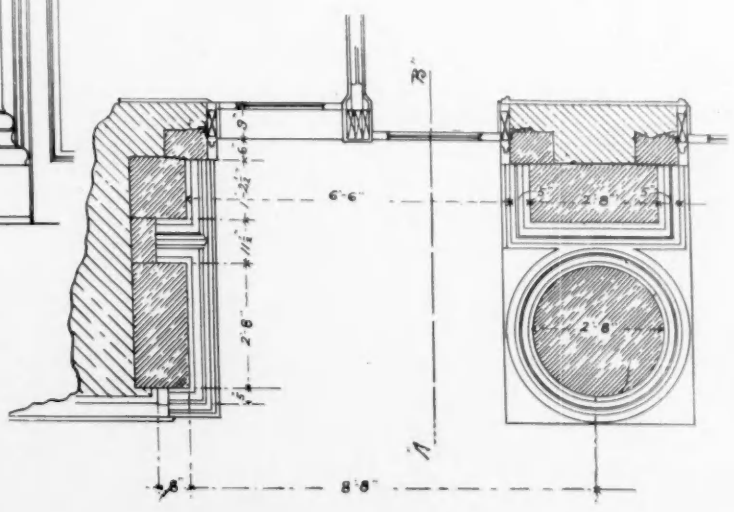
COMPETITIVE DESIGN SUBMITTED BY

CARRERE & HASTINGS,

ARCHITECTS.

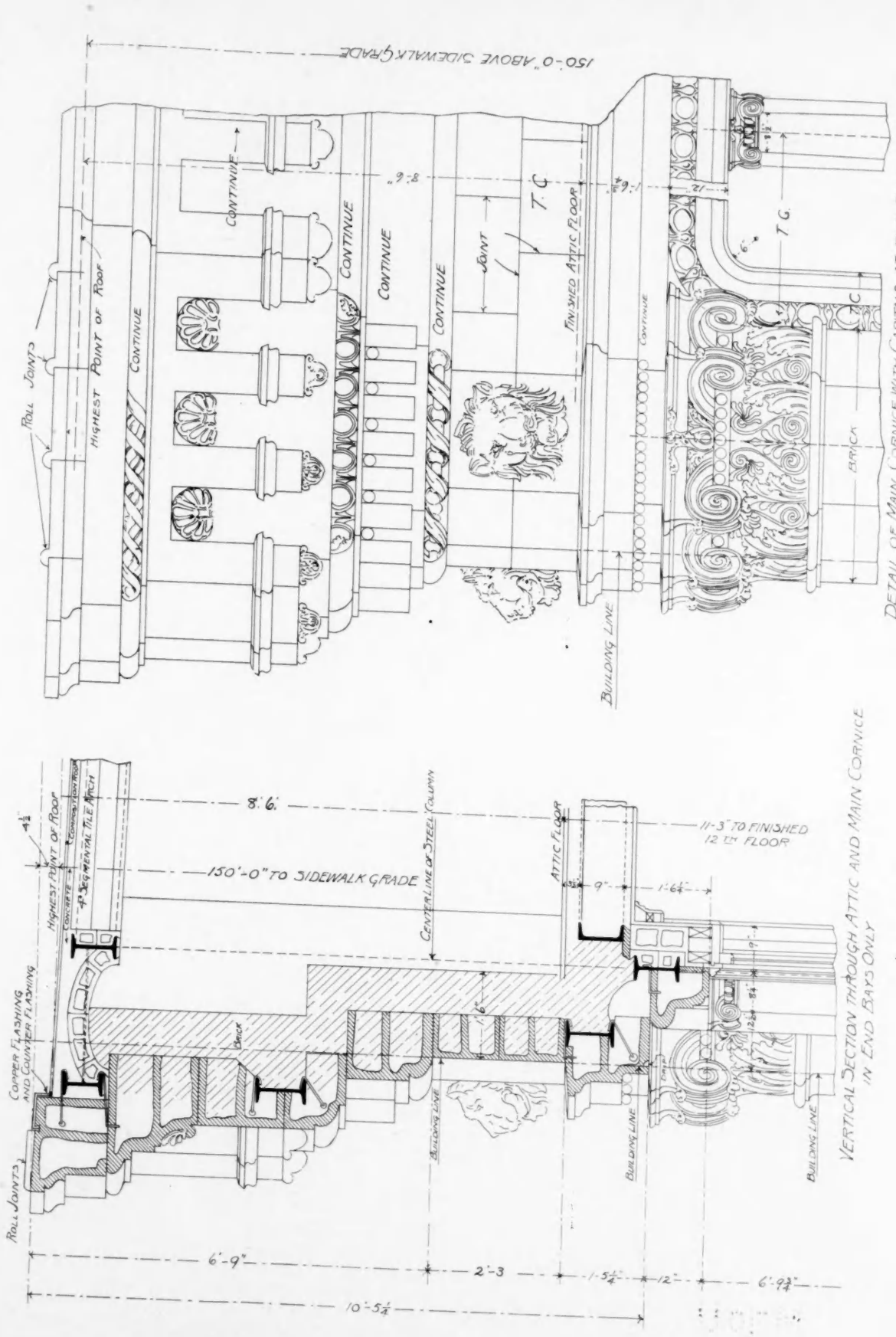






PART ELEVATION
MARQUETTE BUILDING,
CHICAGO.

HOLABIRD & ROCHE, ARCHITECTS.



DETAIL OF MAIN CORNICE WITH CAPITALS AT END BAYS ONLY

VERTICAL SECTION THROUGH ATTIC AND MAIN CORNICE IN END BAYS ONLY

FORT DEARBORN BUILDING

JENNEY & MUNDIE ARCHITECTS